GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

Naoko Ishii
CEO and Chairperson

February 09, 2015

Dear SCCF Council Member:

UNDP as the Implementing Agency for the project entitled: ***Bosnia-Herzegovina: Technology Transfer for Climate Resilient Flood Management in Vrbas River Basin*** has submitted the attached proposed project document for CEO endorsement prior to final approval of the project document in accordance with UNDP procedures.

The Secretariat has reviewed the project document. It is consistent with the proposal approved by the SCCF Council in March 2014 and the proposed project remains consistent with the Instrument and GEF policies and procedures. The attached explanation prepared by UNDP satisfactorily details how Council's comments and those of the STAP have been addressed. I am, therefore, endorsing the project document.

We have today posted the proposed project document on the GEF website at www.TheGEF.org. If you do not have access to the Web, you may request the local field office of UNDP or the World Bank to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,

Naoko Ishii
Chief Executive Officer and Chairperson

Attachment: GEFSEC Project Review Document
Copy to: Country Operational Focal Point, GEF Agencies, STAP, Trustee

1818 H Street, NW • Washington, DC 20433 • USA
Tel: +1 (202) 473 3202 - Fax: +1 (202) 522 3240
E-mail: gefceo@thegef.org
www.thegef.org

REQUEST FOR CEO ENDORSEMENT

PROJECT TYPE: Full-sized Project
TYPE OF TRUST FUND:SCCF

For more information about GEF, visit TheGEF.org

PART I: PROJECT INFORMATION

Project Title: Technology transfer for climate resilient flood management in Vrbas River Basin			
Country(ies):	Bosnia and Herzegovina	GEF Project ID:[1]	5604
GEF Agency(ies):	UNDP (select) (select)	GEF Agency Project ID:	5241
Other Executing Partner(s):	Bosnia and Herzegovina Ministry of Foreign Trade and Economic Relations	Submission Date: Resubmission Date:	Dec. 19, 2014 Feb 2, 2015
GEF Focal Area (s):	Climate Change	Project Duration(Months)	60
Name of Parent Program (if applicable): ➢ For SFM/REDD+ ☐ ➢ For SGP ☐ ➢ For PPP ☐	N/A	Project Agency Fee ($):	475,000

A. FOCAL AREA STRATEGY FRAMEWORK[2]

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount ($)	Cofinancing ($)
CCA-3 (select)	Adaptation Technology Transfer: Promote transfer and adoption of adaptation technology	Outcome 3.1: Successful demonstration, deployment, and transfer of relevant adaptation technology in targeted areas Outcome 3.2: Enhanced enabling environment to support adaptation-related technology transfer	SCCF	5,000,000	77,260,000
		Total project costs		5,000,000	77,260,000

B. PROJECT FRAMEWORK

Project Objective: To transfer technologies for climate resilient flood management in order to increase resilience of highly exposed rural poor, returnee and displaced persons communities in Vrbas River Basin

Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount ($)	Confirmed Cofinancing ($)
1. Enabling environment for climate risk sensitive water and flood management	TA	1. Key relevant development strategies/policies/legislation integrate climate change-resilient flood	1.1 At least two priority sectoral policies and plans (e.g. agriculture, hydropower, water resources) updated to include climate change	SCCF	655,000	$1,500,000

[1] Project ID number will be assigned by GEFSEC.
[2] Refer to the Focal Area Results Framework and LDCF/SCCF Framework when completing Table A.

		management approaches	modeling results; 1.2. Floodplain management and spatial planning regulations and policies updated to include climate change risks (revision of land use regulations, stricter policy on construction permits in the areas prone to flooding, etc); 1.3. Appropriate adaptation technology solutions for climate resilient flood management in BiH codified and disseminated.			
2. Technical and institutional capacity for transferring climate resilient flood management technologies and approaches	TA	2. Climate resilient flood risk management is enabled by transferring modern technologies and strengthening institutional capacities	2.1. Improved hydrological and hydrodynamic model for the VRB incorporating climate change predictions, developed to produce flood hazard inundation maps for spatial planning and emergency response planning, and for the long-term strategic flood risk management of the VRB; 2.2. GIS-based vulnerability, loss and damages assessment tool and database established and institutionalized to record, analyze, predict and assess hydro-meteorological and other hazard events and associated losses;	SCCF	1,315,000	1,600,000
	Inv		2.3. Hydro-meteorological monitoring system in the VRB upgraded (increased from 11 to 25 gauging stations) and harmonized into a central hydrometric	(select)		

			system;			
	TA		2.4. Institutional capacity strengthening plan developed and targeted training on climate-induced flood risk management provided to at least 100 practitioners and decision-makers;	(select)		
3. Climate resilient flood management technologies for vulnerable communities in VRB	TA	3. New technologies and approaches for enhanced flood risk management applied to increase resilience of vulnerable communities in VRB	3.1. Integrated land use and flood risk management plan for the VRB developed and non-structural measures implemented by local communities (through Output 3.2.), government and/or private sector;	SCCF	2,780,000	74,100,000
	Inv		3.2. Participatory community-based adaptation strategies, technologies and practices implemented in priority flood risk areas (e.g. community afforestation scheme on the flood plains; establishing locally controlled and managed flood zones; watershed rehabilitation works, etc);	(select)		
	TA		3.3. Local communities (particularly women and refugees) trained to implement and maintain flood resilient non-structural intervention measures, including agricultural practices such as agro-forestry, to improve livelihoods of 13communities in the VRB, and community-based flood early warning systems; 3.4. Early warning system in VRB	(select)		

			modified to include the new hydrometric monitoring network as part of a fully-integrated flood forecasting system (comprised of centrally-based and community-based early warning systems). Municipal-level flood response and preparedness plans prepared and implemented.			
	(select)			(select)		
				Subtotal	4,750,000	77,200,000
				Project management Cost (PMC)[3]	SCCF	250,000	60,000
				Total project costs	5,000,000	77,260,000

C. SOURCES OF CONFIRMED COFINANCING FOR THE PROJECT BY SOURCE AND BY NAME ($)

Please include letters confirming cofinancing for the projeSct with this form

Sources of Co-financing	Name of Co-financier (source)	Type of Cofinancing	Cofinancing Amount ($)
Other Multilateral Agency (ies)	UNDP	Cash	1,500,000
Other Multilateral Agency (ies)	UNDP	In-kind	60,000
National Government	Sava River Watershed Agency of FBiH	Cash	700,000
National Government	Ministry of Agriculture, Forestry and Water Management of RS	Cash	75,000,000
Total Co-financing			77,260,000

D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY[1]

GEF Agency	Type of Trust Fund	Focal Area	Country Name/ Global	(in $)		
				Grant Amount (a)	Agency Fee (b)[2]	Total c=a+b
UNDP	SCCF	Climate Change	Bosnia and Herzegovina	5,000,000	475,000	5,475,000
Total Grant Resources				5,000,000	475,000	5,475,000

[1] In case of a single focal area, single country, single GEF Agency project, and single trust fund project, no need to provide information for this table. PMC amount from Table B should be included proportionately to the focal area amount in this table.

[2] Indicate fees related to this project.

F. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

[3] PMC should be charged proportionately to focal areas based on focal area project grant amount in Table D below.

Component	Grant Amount ($)	Cofinancing ($)	Project Total ($)
International Consultants	501,000	232,500	733,500
National/Local Consultants	390,000	324,000	714,000

G. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? No

(If non-grant instruments are used, provide in Annex D an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF/NPIF Trust Fund).

PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF[4]

A.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biennial Update Reports, etc.N/A

A.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities. N/A

A.3 The GEF Agency's comparative advantage: N/A

A.4. The baseline project and the problem that it seeks to address: N/A

A. 5. Incremental /Additional cost reasoning: describe the incremental (GEF Trust Fund/NPIF) or additional (LDCF/SCCF) activities requested for GEF/LDCF/SCCF/NPIF financing and the associated global environmental benefits (GEF Trust Fund) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project: N/A

A.6 Risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and measures that address these risks: N/A

A.7. Coordination with other relevant GEF financed initiatives N/A

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

B.1 Describe how the stakeholders will be engaged in project implementation.

On state and entity level, ministries responsible for water management, water agencies, hydro meteorological institu change focal point in BiH (Ministry of Spatial Planning, Construction, and Ecology of Republika Srpska) and other related ministries, as well as civil protection were invited to participate in project preparation. On entity and canton political, operational and executive jurisdictions for water sector rest with line Ministries in charge of water. On lo project preparation phase the project has mapped all stakeholders in the project area and created a reference group i municipality. Civil protection organizations and representatives from municipal government actively participated in preparation. All organisations consulted provided data and information requested during interviews, questionnaires consultation.

The project includes extensive consultation activities including the following:

- Establishment of an inter-agency working group to help outline and examine the current policy framework water and flood risk management in BiH and which could best elaborate current practice and deficiencies with resp

[4] For questions A.1 –A.7 in Part II, if there are no changes since PIF and if not specifically requested in the review sheet at PIF stage, then no need to respond, please enter "NA" after the respective question.

the inclusion of climate change considerations. The working group will be comprised of representatives from all re and organisations across entities, and will be a primary forum for wide inclusion and consultation from the beginnir throughout the process to ensure buy-in to all aspects of the project activities, in particular the proposed changes to strategies and plans to embed climate change. This approach will enable an active participatory approach and will e experts from relevant line-ministries and water agencies, ion development of sectoral policies.

- Consult with sector leaders on final proposed new sector policies, strategies and plans, including an invitati and make recommendations on the changes.
- Consultation with all stakeholders the proposed flood zones and on the proposed designated/permitted land with the flood zones.
- Engage and involve the community in the development of climate resilient adaptive measures that will mee
- Consult with the ongoing WB project 'Sustainable Forest and Landscape Management Project' on afforesta
- Consult relevant stakeholders on structural and non-structural flood management options
- Obtain feedback from the stakeholder consultation processes to refine the preferred option(s) and re-assess and socio-economic performance of the option(s).
- Undertake extensive community surveys to help characterise the socio-economic status of the communities first-hand, what their issues are and what they would like to see as the solutions.
- Develop and implement Community engagement, mobilization and sensitization plans.
- Consultation on the proposed EWS and in particular consultation with communities on proposed communit schemes.
- The project will design and implement a public-facing website presenting key layers of information, with th disseminate early warning information to the public. The website will also be part of the Participatory Assessment, enable stakeholders to upload information and provide opinions.
- The project will produce an article and footage every year to showcase what has been done and what has be annually.

B.2 Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund/NPIF) or adaptation benefits (LDCF/SCCF):

In response to the mounting climate change-induced risk exacerbated by anthropogenic factors and vulnerabilities in the Vrbas basin, BiH needs to ensure that it implements adaptation technologies that enable a flood risk management approach which is based on a well-developed knowledge base of flood risk. Such an approach should include strategies for the avoidance of flood emergency situations through effective climate resilient spatial planning, the mitigation of the flood damage and loss through the implementation of sustainable climate resilient intervention measures, and the introduction of a unified monitoring, forecasting, early warning and emergency response system. Such an approach should ideally be underpinned by the development of regulations and policies to ensure adequate cross-sectoral enforcements as well as a coordination mechanism which would enable coordination between Entities and between Entity and State level. It will also require any legislative and policy framework to fully embed climate change considerations, something which is currently missing in BiH.

The project will support the most vulnerable groups of society, as well as government at all levels to undertake direct adaptation measures; those that minimize the exposure of people and economic assets and ensure that potential damage is limited to acceptable levels. The project will strengthen the early warning system for these events that are likely to escalate both in frequency and intensity as a result of climate change. In addition, the project will strengthen BiH's technical capacity to assess and manage flood risks, and ensure that such management measures are aimed at adaptation to climate change. This will include the development of flood risk management tools and methods that take full account of climate change considerations and that enable the development and design of sustainable, climate resilient solutions. Importantly, the affected communities in the Vrbas basin will be fully engaged and empowered to participate in the adaptation measures for the basin.

In engaging with the communities, the project will pay particular attention to inclusion of vulnerable groups and particularly women to ensure that gender issues are taken into account. Gender affects all aspects of vulnerability

in societies and there is a need to measure the difference in gender vulnerability to understand who will be at greatest risk in the event of a disaster and evaluate the differential impacts among different groups. One type of differential vulnerability between women and men arises from biological factors. Pregnant and nursing mothers are particularly vulnerable because of their increased need for food and water and their decreased mobility. As the primary caretakers of their homes, women tend to the needs of children, elderly and the disabled. This increases their workload and reduces their mobility in cases where quick evacuations are required or where they live a long distance from evacuation routes. Gender also influences the allocation of social and economic resources in ways that exacerbate women's vulnerability to natural disasters. Women generally have more limited access to the resources their families need for survival and recovery in the wake of disaster. Formal risk management tends to be male oriented despite the fact that women are custodians of family health and hygiene and providers of domestic water and food, all of which is affected by flooding. In addition, ECLAC studies have shown that, female reproductive health is often affected by flooding. The participatory flood risk and vulnerability assessment would also consider the details of each flood warning scheme in terms of the operational benefits, equipment required, staffing levels, organisational structures, output indicators, and ongoing commitment to maintain and keep the scheme functioning (and the assistance available on all levels). This project will aim to use participatory methods as much as possible and will ensure the inclusion of women in these participatory approaches.

In BiH there are large differences between the genders, in line with traditional gender roles. Men are more than twice as likely as women to be employed, self-employed or engaged in contract work. In general, male-headed households have higher incomes than female-headed households and overall there is a big difference in the income of male-headed households (780 KM/month) and single female households (431 KM), which emphasises the increased vulnerability of female-headed households. For effective flood risk management, the project will ensure that women are primary stakeholders and will therefore need to be involved in decisions on the types of solutions that are implemented.

An assessment of the gender-related baseline for each output of the project has been undertaken, and gender-specific target indicators developed which will be used to monitor the projects performance in achieving the right gender balance.

B.3. Explain how cost-effectiveness is reflected in the project design:

The project is cost-effective in as much as it implements flood management measures that are more resilient to long term impacts of climate change on hydrological dynamic and increased frequency and intensity of climate hazards. The country that loses on average 5-15% of GDP as a result of floods of magnitude similar to those of 2010 and 2014 events and has overall municipal budget that are, on average 47% of flood damages annually, requires a more long term vision to effectively prevent and adapt to climate hazard risks that are to be exacerbated based on regional and national climate change scenarios. To assess the cost effectiveness of the project, two different scenarios have been examined. The first is an alternative project approach which seeks to address flood risk by structural intervention measures only, while the second is the business-as-usual (no project) scenario.

A plausible alternative approach to the current project design would be to implement structural intervention measures to address flood risk in the VRB. The estimated length of flood defences that would be required to protect areas that experience flooding on a regular basis is 141.3km. Assuming a cost of approximately $0.5 Million USD per 1km of defence, this would require 67 Million Euros to protect all currently flooded areas in the basin. This does not take account of climate change, nor the annual maintenance cost of flood defences. If the project budget of $5 Million USD were to be distributed among the 13 municipalities that experience flooding on a regular basis for flood defences, each municipality would receive $384,615 USD, which would not be sufficient to construct 1km of flood defence in any given municipality. Even if the 5 Million was spent on one main flood defence, it would not yield very much in terms of the size of the population that would be defended by that one structure. The cost to benefit ratio would therefore be very low. The discussions in Component 3 have already highlighted the pros and cons of structural and non-structural approaches to flood

protection. In the Vrbas basin and in BiH in general, traditional structural measures have proven to be ineffective when used as the sole flood risk management approach, due to their high capital and maintenance costs. While this project will transfer technology by introducing modern tools and approaches to the design of defences, it would not be cost effective to spend SCCF funds on the construction of what would be limited and ineffective flood defences.

On average, 3Million USD damage was incurred in VRB per year over the period 2003-2013. In 2010 VRB incurred 15.7 Million USD in damages. In 2014 2.9 Billion USD of damages was experienced in BiH, with 87 Million USD for damages reported in VRB. The return period of the 2010 rainfall was approximately 1 in 20-25 years, while the 2014 event has been estimated at a return period of 1 in 500 years. Assuming that the current situation is the Do-Nothing (baseline or no-project) scenario, it is reasonable to assume that the Do Something scenario (the project) will achieve 100% benefits for VRB basin for normal floods (i.e. average annual damages of 3 Million USD averted, or 15.7 Million USD averted if the 2010 event is considered). The Do-Nothing Present Value damages is assumed to be 100% of the damages in any given year. The PV cost is the cost of the project (5.00 Million USD). Hence with 100% damages averted the benefit-cost ratio for VRB is 1.7, if only the average annual damages are averted, 3.14 if the project delivers a standard of protection equivalent to the 2010 equivalent PV benefits, and 17.4 if protection against events of the size of the 2014 is achieved. The project will seek to deliver Standards of Protection of greater than the 1 in 25 year but less that the 1 in 500 year (international best practice standard is 1 in 100 year for populated areas and lower for non-populated areas, depending on the land use). Hence it is reasonable to assume that the cost-benefit ratio for the project will lie between 3.14 and 17.4. The project will undertake more detailed assessment of economic benefits of each component, and for the project as a whole, which will provide a better assessment of benefit-cost ratio.

The above damages analysis does not include the government's contributions to annual maintenance of the flood defenses, as these are business-as-usual costs associated with the government's normal annual budgets to deal with flooding emergencies. The damages data used in the analysis are on top of the government's business as usual costs, and so the analysis shows the government expenditure over and above its annual budget, to deal with flood risk. The cost-benefit analysis is therefore more in line with a 'business as usual' scenario (or Do Minimum) than a Do nothing. Do nothing is therefore used in the context of 'No project'. The analysis shows that if the government continues to undertake reactive, reparatory and ad hoc measures, it will continue to fail to effectively respond to flood risk. If the project is undertaken and provides benefits through its basin-level and long term climate change resilient flood management measures, then the benefit to cost ratio is 3.14 to 17.4. It is not possible to quantify the benefit provided by other funds as, although there are other projects in the region, none provides the level of intervention and hence benefits that this project would, because the technical and geographical focus of other projects are not are comprehensive as this project.

The current approach to flood risk management in BiH is largely reactive, with DRR interventions focusing on response, recovery and compensation. This includes the implementation of works to reconstruction/repair flood defences to existing levels thus providing the same standard of protection despite the increasing risk (frequency and magnitude) of failure of defenses under climate change. Indeed present disaster risk reduction activities in VRB are mainly focusing on developing local capacities to cope with regularly recurring floods. These actions are not taking into account the changing magnitude and frequency of floods, and long-term efforts to adapt to changing climate. Thus this proposed project is the first ever attempt to address long-term flood management measures and strengthen capacity of relevant institutions.

The aim of this project is to put in place, long-term flood management measures which will enable the government of BiH to manage flood risk in a more sustainable manner. Flood plain management measures such as development zoning, for example, should reduce the need for response and recovery as the populations at risk will be greatly reduced. In addition, the need to compensate for flood damage will be reduced, as fewer properties will be affected by flooding. Under this project, direct measures including the construction of structural defenses which take account of climate change will provide a higher standard of protection that takes account of changing flood levels with climate change. This will reduce the risk of defense structure failure (operational and structural failure). Under this project a number of direct intervention structural measures will be implemented, which will complement and improve on the government's annual flood defense work. This project therefore offers the critical long-term adaptation and climate resilient flood management measures required for the basin. It will also develop and provide the tools (e.g. modelling, monitoring, forecasting and early warning) that will enable the government to manage flood risk in a more sustainable and cost-effective manner.

C. DESCRIBE THE BUDGETED M &E PLAN:

The project will be monitored through the following M& E activities. The M& E budget is provided inChapter 6 of the project document and is outlined below.

Project start:

A Project Inception Workshop will be held within the first 2 months of project start with those with assigned roles in the project organization structure, UNDP country office and where appropriate/feasible regional technical policy and programme advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan.

The Inception Workshop should address a number of key issues including:

a) Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of UNDP CO and RCU staff vis à vis the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.

b) Based on the project results framework and the relevant SOF (e.g. GEF) Tracking Tool if appropriate, finalize the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.

c) Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed and scheduled.

d) Discuss financial reporting procedures and obligations, and arrangements for annual audit.

e) Plan and schedule Project Board meetings. Roles and responsibilities of all project organisation structures should be clarified and meetings planned. The first Project Board meeting should be held within the first 12 months following the inception workshop.

An Inception Workshop report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

Quarterly:

- Progress made shall be monitored in the UNDP Enhanced Results Based Managment Platform.

- Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS. Risks become critical when the impact and probability are high. Note that for UNDP GEF projects, all financial risks associated with financial instruments such as revolving funds, microfinance schemes, or capitalization of ESCOs are automatically classified as critical on the basis of their innovative nature (high impact and uncertainty due to no previous experience justifies classification as critical).

- Based on the information recorded in Atlas, a Project Progress Reports (PPR) can be generated in the Executive Snapshot.

- Other ATLAS logs can be used to monitor issues, lessons learned etc... The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

Annually:

- Annual Project Review/Project Implementation Reports (APR/PIR): This key report is prepared to monitor progress made since project start and in particular for the previous reporting period (30 June to 1 July). The APR/PIR combines both UNDP and SOF (e.g. GEF) reporting requirements.

The APR/PIR includes, but is not limited to, reporting on the following:

- Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative)
- Project outputs delivered per project outcome (annual).
- Lesson learned/good practice.
- AWP and other expenditure reports
- Risk and adaptive management
- ATLAS QPR
- Portfolio level indicators (i.e. GEF focal area tracking tools) are used by most focal areas on an annual basis as well.

Periodic Monitoring through site visits:

UNDP CO and the UNDP RCU will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report/BTOR will be prepared by the CO and UNDP RCU and will be circulated no less than one month after the visit to the project team and Project Board members.

Mid-term of project cycle:

The project will undergo an independent Mid-Term Evaluation at the mid-point of project implementation (insert date). The Mid-Term Evaluation will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will

highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the mid-term evaluation will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-term evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-EEG. The management response and the evaluation will be uploaded to UNDP corporate systems, in particular the UNDP Evaluation Office Evaluation Resource Center (ERC).

The relevant SOF (GEF) Focal Area Tracking Tools will also be completed during the mid-term evaluation cycle.

End of Project:

An independent Final Terminal Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNDP and SOF (e.g. GEF) guidance. The final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term evaluation, if any such correction took place). The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-EEG.

The Final Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded to PIMS and to the UNDP Evaluation Office Evaluation Resource Center (ERC).

The relevant SOF (e.g GEF) Focal Area Tracking Tools will also be completed during the final evaluation.

During the last three months, the project team will prepare the Project Terminal Report. This comprehensive report will summarize the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

Learning and knowledge sharing:

Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums.

The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons learned. The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects.

Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

Communications and visibility requirements:

Full compliance is required with UNDP's Branding Guidelines. These can be accessed at http://intra.undp.org/coa/branding.shtml, and specific guidelines on UNDP logo use can be accessed at: http://intra.undp.org/branding/useOfLogo.html. Amongst other things, these guidelines describe when and how the UNDP logo needs to be used, as well as how the logos of donors to UNDP projects needs to be used. For the avoidance of any doubt, when logo use is required, the UNDP logo needs to be used alongside the GEF logo. The GEF logo can be accessed at: http://www.thegef.org/gef/GEF_logo. The UNDP logo can be accessed at http://intra.undp.org/coa/branding.shtml.

Full compliance is also required with the GEF's Communication and Visibility Guidelines (the "GEF Guidelines"). The GEF Guidelines can be accessed at: http://www.thegef.org/gef/sites/thegef.org/files/documents/C.40.08_Branding_the_GEF%20final_0.pdf. Amongst other things, the GEF Guidelines describe when and how the GEF logo needs to be used in project publications, vehicles, supplies and other project equipment. The GEF Guidelines also describe other GEF promotional requirements regarding press releases, press conferences, press visits, visits by Government officials, productions and other promotional items.

Where other agencies and project partners have provided support through co-financing, their branding policies and requirements should be similarly applied.

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT(S) ON BEHALF OF THE GOVERNMENT(S):): (Please attach the Operational Focal Point endorsement letter(s) with this form. For SGP, use this OFP endorsement letter).

NAME	POSITION	MINISTRY	DATE *(MM/dd/yyyy)*
Senad Oprasic	GEF Operational Focal Point	MINISTRY OF FOREIGN TRADE AND ECONOMIC RELATIONS	06/03/2014

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for CEO endorsement/approval of project.

Agency Coordinator, Agency Name	Signature	Date *(Month, day, year)*	Project Contact Person	Telephone	Email Address
Adriana Dinu UNDP-GEF Executive Coordination		Dec. 19, 2014	Keti Chachibaia, Regional Technical Specialist	+66 (0)2 304 9100 ext. 5091	keti.chachibaia@undp.org

ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).
The project results framework can be found in Chapter 3 of the Project Document

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

Comments from GEF Secretariat at PIF stage

GEF Comment:
More information is requested regarding Output 1.3. The remaining components and outputs are clear and sound, and include: mainstreaming of climate change information in priority sector policies; improved hydrological and hydrodynamical models for VRB to produce flood risk maps; improved GIS capabilities for hazard prediction/analysis and assessment of associated losses; improved hydromet monitoring; trainings on climate change and flood risk for practitioners and decision-makers; EWS; and community-based flood risk plans, adaptation strategies and technologies, and trainings.
Recommended action: Please explain more precisely what is meant by "state-of-art adaptation technology solutions for climate-resilient flood management codified and replicated at national level".

UNDP response:
The formulation of the Output 1.3. revised: Appropriate adaptation technology solutions for climate resilient flood management in BiH codified and disseminated.
Additional text included in PIF (page 17): This Output will collect lessons learned from Outputs 1.1 and 1.2. and Outcomes 2 and 3 and facilitate dissemination of successful approaches in the country. In particular, the project aims to transfer best available approaches in climate resilient flood risk management from around the world and adapt them for the Vrbas River Basin. After implementation in the Vrbas River Basin, the successful practices will be codified in a form of guidance documents and upscaling in the rest of the country will be promoted. Most countries that are advanced in flood risk management (for example the UK) have nationally accepted guidance documents and tools on how to undertake flood risk management for any part of their territories and this project will aim to establish such national guidance and tools in BiH based on the work done under other Outputs.

GEF Comment:
Component 2 includes hard-technology related outputs such as upgrades to the hydromet monitoring system, which may be costly.
Recommended action: Please clarify whether the proposed SCCF grant ($1.3 M) and co-financing ($2 M) amounts will be sufficient for Component 2.

UNDP response:
According to the preliminary assessment, the US$ 1.3 million should be sufficient to cover Component 2. With regards to hard-technology related outputs, budget calculation was done together with hydro- meteorological institutes of Republika Srpska and of the Federation of Bosnia and Herzegovina. The calculation was based on their needs, current status of the network and current prices of equipment and services on the market:
1.According to hydro-meteorological institutes, 14 new gauging and meteo-stations, each cca US$31,000 will be required. Additional funds will be required for installation and calibration.
2.Another significant investment will be required for the development of hydraulic model, in particular for cross section surveying (ca. 4000 sections, US$200,000) and hydrodynamic modeling (US$200,000). These calculations are based on the market survey by the Hydro Engineering Institute.

The co-financing will mainly cover existing data, maps as well as technical support from the government water agencies. According to the Sava River Water Agency, they will spend cca US$ 1 million on different maps and preliminary flood risk assessment, which will be made available to the project. Another Euro 1 million is in the hard pipeline of the same agency for preparation of flood maps and models.

Recommended action by CEO endorsement stage:

GEF Comment:
How will guidance docs and tools be used to promote up-scaling in rest of country.

UNDP response:
Output 1.3 will develop the guidance documents and tools (technology tools will be developed under Output 2.1, 2.2 and 2.3). The project, based on a holistic approach, will embed these documents and tools via various project outputs as follows:

a) By incorporating tools and guidance documents into policy and regulatory changes to be made under Outputs 1.1 and 1.2, thus making them compulsory for national implementation to other basins.
b) By Linking guidance docs and tools to new procedures with FRM framework. For example flood forecasting protocols will be based on codified guidance docs (Output 3.4)
c) Train practitioners in the use of tools and guidance documents as part of the project and identify longer term training needs to ensure continued dissemination and use of guidance and tools (make training in essential tools and guidance compulsory requirements of certain jobs). Under Output 2.4
d) Provide platform for the easy access to guidance and tools via government website to be developed in Output 1.2
e) Project will seek to establish university course in CR-FRM (under Output 2.4) which will include training in use of guidance and tools

GEF Comment:
Please provide more detailed information on public participation

UNDP reponse:
Public Participation is detailed under Component 3 (see e.g. paragraphs 168-180) and in particular Output 3.2 activities which are:

Output 3.2 deliverables
1) PGIS Tool established and managed
2) Training provided to 200 people in the use of the PGIS tool
3) Community engagement, mobilization and sensitization plans developed and implemented in 13 municipalities
4) Community Communications strategy for FFEWS developed and implemented in 13 municipalities
5) Community-specific Intervention plans with participation of the local communities developed and implemented in 13 municipalities
6) Community-based programs for FRM identified, designed and implemented
Indicative Activities
1) Undertake extensive community surveys to help characterise the socio-economic status of the communities and to hear first-hand, what their issues are and what they would like to see as the solutions.
2) Identify and review existing community-based programs of relevance and identify entry points into existing community-based schemes (e.g. through Water Users Associations).
3) Establish Participatory Geographical Information Systems (PGIS) approach and implement as a means of integrating local community information into the assessments of the problem and the formulation of the solution and to strengthen involvement of communities or marginalized groups in decision making. PGIS will be a tool included in the GIS-based socio-economic tool (or a separate tool to be used alongside it).
4) Develop Community engagement, mobilization and sensitization plans.
5) Develop Community Communications strategy for FFEWS.
6) Develop Community-specific Intervention plans with participation of the local communities.
7) Mobilise communities in the implementation in intervention plans

GEF Comment:
Please address potential risks (and their mitigation) posed to sustainability of the proposed SCCF measures, both to institution-level actions and to community level approaches

UNDP response:
Project Risks are detailed in Table in Annex 1 and include mitigation action at all levels.

GEF Comment:

Please clarify whether the proposed SCCF grant ($1.3 M) and co-financing ($2 M) amounts will be sufficient for Component 2.

UNDP response:
We have undertaken a detailed bottom-up costing exercise during project preparation and confirm that $1.3M SCCF funds will be sufficient for Component 2.

GEF Comment:
Please refer to comments on Items 7, 10 and 11. Gender-disaggregated indicators for beneficiaries should also be included, if possible.

UNDP response:
Comment 7, 10 and 11 are addressed above. Gender-disaggregated indicators have been included in the results framework and separate gender-specific indicators are included in Table 6 of the project document.

Responses to STAP comments/recommendations at PIF

1) The STAP recommends including a description of the current early warning system. It is mentioned in several places without a clear description of its current operation, other than it is manually based and ineffective, or how it would be improved through the project. Also mentioned are hazard maps, but it is unclear the extent to which they are used and useful

   Answer: Described in paragraphs 45-53. See also paragraphs 125, 159 and 160.

2) Further, STAP strongly encourages the flood early warning system to consider more than thresholds for action, but also to provide a detailed response plan developed with all relevant stakeholders. In particular, the design of the EWS should ensure effective response, and monitoring of episodic events as well as longer-term changes in climate.

   Answer: Paragraphs 174 and 178. Output 3.2 deliverables 4&5 (page 59), Output 3.2 Indicative Activities 4-7, Output 3.4 All activities.

3) STAP also strongly encourages strengthening the proposal in terms of adaptive risk management. It is often unclear whether outcomes and outputs are focused solely on reducing current vulnerability or are also intent on increasing the capacity for adaptive management as the climate continues to change. For example, paragraph 61 states the project will ensure that climate change risks are properly incorporated into Emergency Flood Relief and Prevention Project, but without providing further information on how.

   Answer: The entire project is based on the assessment and management of risk under climate change, and implementation of strategic and operational management approaches that are based on a changing climate. For example the flood hazard mapping (on which structural and non-structural measures will be based) will produce flood maps for all flood return periods (probability of exceedance) including climate change. Hence policies such as flood zoning will include regulation of development within the climate change flood zone. Any structural and non-structural measures will be designed to flood depths with climate change factored in. Similarly emergency response plans will be based on hazard mapping that includes the climate change flood zone. Flood insurance flood zones will include a climate change zone within which risk will also be mapped and appropriate premiums set for example.

4) The flood mapping should consider not just current vulnerabilities, but also how those vulnerabilities could change under scenarios of climate change and development pathway. Paragraph 62 states that the maps will be

used in the development of emergency preparedness and response plans, which would be a highly appropriate output, but further details are not provided

Answer: Vulnerabilities: The flood hazard modelling will include climate change scenarios which will produce flood maps under climate change (Annex 4 of the Project document presents the Climate change discussion for Vrbas). Socio-economic mapping and vulnerability assessment will be based on current as well as future development scenarios. Our understanding of where the receptors of flooding are located (property, people, environment), their physical and socio-economic conditions, and their ability to withstand or recover from flooding will be included in the vulnerability model. In predictive mode, the vulnerability model will include projections of where receptors of flooding are likely to be located (e.g. due to planned and un-planned urban expansion, information will be obtained from spatial development plans for the basin) and what their physical and socio-economic characteristics are projected to be. Our understanding of the likely consequences of flooding and the forcing factors that will result in a particular consequence (e.g. what combination of depth and velocity of water etc. would result in loss of life) will form the basis of the risk and vulnerability modelling.

Response plans: See Paragraphs 174 and 178. Output 3.2 deliverables 4&5 (page 59), Output 3.2 Indicative Activities 4-7, Output 3.4 All activities.

5) The flood risks management approaches could use better articulation, including the stakeholders involved, the process for developing and managing flood risks, and the time frame for the flood risk management actions (e.g. covering flood risks through 2050). Further, paragraph 63 states the project will develop tools, methods, guidelines, and procedures for recording flood events, undertaking post-event surveys, and assessing vulnerability to flooding. This is another highly relevant output that is not developed further.

Answer: FRM approaches have been further elaborated under Output 3 of the Project Document. Tools, methods, guidelines, and procedures for recording flood events, undertaking post-event surveys, and assessing vulnerability to flooding have been elaborated under Component 2 (paragraphs 129 to 140) and Output 2.2.

6) STAP recommends a more thorough discussion in the proposal of bio-engineered measures and other approaches for sustainable engineering solutions, and specification of the relevant adaptation technologies. Considering that the project addresses objective CCA-3 pertaining to technology transfer; further elaboration of technology transfer issues may be warranted. For example, long-term absorptive capacity is important to ensure that recipients have the ability to effectively use, modify and enhance deployed solutions. As noted in #3 above, adaptation is an on-going process and without an element of institutional capacity, particularly for modelling, forecasting and assessment, continued adaptation benefits may be difficult to obtain.

Answer: Technology transfer and institutional capacity is elaborated under Component 2 and Output 2.4 deals specifically with institutional capacity building. Relevant technologies to be transferred are also discussed in Component 3.

7) There are multiple, brief mentions of scenario development without detailing the goals, methods, and stakeholders to be involved. UNDP might consider modifying the storylines and quantifications of the new scenario process

http://www2.cgd.ucar.edu/research/iconics, as required to be relevant for the project. The Shared Socioeconomic Pathways (SSPs) being developed as part of the new climate change scenario process describe a range of possible development pathways, including qualitative descriptions and quantitative variables such as demographic growth, education, and GDP. Although the SSPs are described on the global scale, they can be

extended regionally and sectorally to provide input for the descriptions of future socio-economic-environmental conditions that would be relevant for scenario-based planning in the project.

Answer: The project will certainly look at the SSPs scenarios as a possible source of projections of socio-economics conditions. However we will look to ensure that locally relevant projections are given priority as far as possible. In addition, since the project will be developing methods, tools etc. for the systematic collection and analysis of socio-economic data, we will look for possibilities to collect data on projections where possible and will undertake socio-economic forecast modelling based on data collected. It should be noted that since the model will be able to take a number of different data sources as input data, there should be no difficulty in testing alternative datasets such as the SSPs scenario data.

8) The PIF mentions in several places the baseline situation includes unsustainable farming practices (e.g. paragraphs 19, 68, and others) without describing those practices, and does not clarify the proposed actions to increase sustainability. Similarly, the PIF mentions unsustainable floodplain development in the baseline situation without further clarification.

Answer: Paragraphs 265-285 in Annex 11.

9) Since the PIF mentions the use of existing dams for hydropower, it may be appropriate to consider the energy supply risks associated with climate change. See, for example, Ostojic, G., Stankovski, S., Ratkovic, Z., Miladinovic, L., & Maksimovic, R. (2013). Development of hydro potential in Republic Srpska. Renewable and Sustainable Energy Reviews, 28, 196-203.

Answer: The project will not specifically deal with the energy supply risks associated with climate change as this is outside the scope of the project. The project will, however, examine the impact of climate change on HPP dams with respect to flood risk and opportunities for storage. Any changes we suggest will be thoroughly examined as part of the feasibility studies. For example most HPP dams have a well-established relationship between minimum operating levels for effective supply, so if we propose to hold HPP dams at a lower level than currently operated to provide flood storage benefits, it should be fairly straightforward to establish what the impact on generation would be. This would be the extent of our investigations into energy generation/supply and we feel that anything more would be outside the scope of the project. As with all other interventions we will ensure that the right stakeholders are engaged and consulted on all proposed measures, and this includes energy sector stakeholders. See paragraphs 9-13 and 282-285 for the baseline discussion on the energy sector aspects of relevance to the project.

10) The STAP recommends strengthening the discussions of how the national, regional, and local scale issues will be integrated. Some outputs will take place across local to national scales without a clear description of how the scales will be linked.

Answer: Section 2.1.2

11) STAP encourages UNDP to strengthen the gender aspects of the project. The importance of gender is mentioned, without providing specifics as to how gender will be incorporated.

Answer: Section 2.5

12) Another possible stakeholder is the Ministry of Health, to ensure that actions taken do not inadvertently increase health risks.

Answer: During the Inception phase, we will undertake a further stakeholder identification exercise to confirm the stakeholders identified during PPG and to identify additional stakeholders. This will also apply to all subsequent stages of the project. During feasibility studies (before the design and implementation of interventions measures) impact assessments will be made. Hence, it is expected that all relevant Ministries (including the Ministry of Health) will be engaged as necessary.

13) Other issues include:

a. A list of acronyms would be helpful. **Done**
b. The estimated population in the Vrbas river basin varies across the PIF, including when indicating the size of the vulnerable population (e.g. 33% of 510,000 is not 100,300). Recent and consistent estimates, including how many people live in rural areas and the number of returnees and other vulnerable groups would strengthen the proposal. **Done (paragraph 2.2).**
c. The PIF mentions the costs of recent floods (e.g. paragraph 13), without providing further details as to the specific impacts or providing a reference. **Section 1.1.2**
d. Paragraph 20 is one of several mentions of socially excluded groups without clarifying to whom this refers.
   The project targets the following marginalized groups: returnees, displaced persons and the rural poor. Addressed in Sections 1.1. and 1.2, paragraphs 134 and 195 and throughout the document
e. Paragraph 56 discusses the limited human capital, but does not revisit this issue in the output and outcomes to indicate how it will be addressed. **Addressed in Outcome 2 (particularly Output 2.4) and throughout the document.**
f. Several places mention there are "a number" of gauges that need repair. Quantification would be helpful during proposal development. **Paragraph 125.**
g. Paragraph 72 states Component 2 includes vulnerability surveys, but I could not find text to describe this issue. **See Output 2.2 and paragraph 173**.
h. How will the project contribute to reconciliation within the country?

Answer: Such an important issue as flood risk management requires close political cooperation at all levels. Entity governments, with encouragement from the state level, will work together to alleviate flood threats for their citizens. Their joint approach is necessary to create an enabling environment to successfully minimize flood risk. More importantly, the geographical area covered by the project is populated by all constitutional nations in Bosnia and Herzegovina. Dealing with floods, which is of vital importance for all inhabitants of VRB regardless of their nationality and political affiliation, will certainly bring people together. Joint implementation of project activities will be another mechanism which will show people that resolution of this crucial issue can only be done by working together by all involved parties: the ones upstream and the ones downstream.

i. Paragraph 88 mentions tools for long-term assessment of vulnerability. Where are these described? **Output 2.2**

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS[5]

A. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES FINANCING STATUS IN THE TABLE BELOW:

PPG Grant Approved at PIF: **150,000**			
Project Preparation Activities Implemented	***GEF/LDCF/SCCF/NPIF Amount ($)***		
	Budgeted Amount	***Amount Spent Todate***	***Amount Committed***
International Consultants	50,000	42,314	9,940
Local Consultants	70,000	55,689	18,100
Travel	10,000	7,215	1,000
Supplies	3,000	1,171	1,000
Miscellaneous	2,000	1,695	1,000
Workshops & Trainings	15,000	5,014	5,862
Total	150,000	113,098	36,902

[5] If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities.

ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used**)**

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/NPIF Trust Fund or to your Agency (and/or revolving fund that will be set up)

N/A

United Nations Development Programme

Country: Bosnia and Herzegovina
PROJECT DOCUMENT

Project Title: Technology transfer for climate resilient flood management in Vrbas River Basin

UNDAF Outcome(s): Outcome 5: By 2019 legal and strategic frameworks are enhanced and operationalized to ensure sustainable management of natural, cultural and energy resources.

UNDP Strategic Plan Primary Outcome: 1. Growth and development are inclusive and sustainable, incorporating productive capacities that create employment and livelihoods for the poor and excluded. Output: 1.4 Scaled up action on climate change adaptation and mitigation across sectors which is funded and implemented

Expected CP Outcome(s):

Outcome 5: By 2019 legal and strategic frameworks are enhanced and operationalized to ensure sustainable management of natural, cultural and energy resources.

Expected CPD Output (s)

Lead output: Output 5.2: Subnational actors implement climate change adaptation (CCA) and mitigation measures, sustainable energy access solutions, and manage natural resources sustainably.

Complementary Output 5.1: Harmonized policies and legal frameworks enforced in accordance with international obligations.

Complementary Output 3.2: UNDAF outcome 3. By 2019, there is effective management of war remnants and strengthened prevention and responsiveness for man-made and natural disasters, Output 2. Legal and policy frameworks in place supporting implementation of disaster and climate risk management measures, including gender perspective

Executing Entity/Implementing Partner: UNDP

Brief Description

Bosnia and Herzegovina (BiH) is a middle income country with an estimated 3.8 million inhabitants, which is still recovering from the 1992-1995 war which had a devastating impact on its human, social and economic resources, leading to enormous challenges of the post-war reconstruction and economic and social recovery. This challenge has been further compounded by the transition towards market economy requiring structural reforms and improved governance. The slow rate of the post-war economic recovery of Bosnia and Herzegovina has been compounded by the negative impacts of climate change on key sectors such as agriculture, energy (hydropower), the environment and, in particular, the frequency and magnitude of flood disasters, which have tripled in frequency in the last decade. In May 2014, Bosnia and Herzegovina experienced its worst flooding in 150 years which resulted in 23 deaths and $2.7 Billion USD worth of damages which is 15% of GDP, and is expected to result in a 1.1 percent contraction in the economy this year, compared to the growth of 2.2 percent that had been predicted before the flood.

BiH is significantly exposed to the threats of climate change, but has very limited capacity to address and adapt to its negative impacts, in particular the frequency and magnitude of floods from its major rivers. The Vrbas River basin is characterized by a large rural population comprised of the poorest and most vulnerable communities in BiH, including war returnees and displaced people, with high exposure to flooding and its devastating impacts. The SCCF funds will be used to enable the communities of the Vrbas basin to adapt to flood risk through the transfer of adaptation technologies for climate resilient flood management, upgrade and rehabilitation of the hydrometric monitoring network, development of a flood forecasting system and early warning system, development of emergency response plans, and provision of training in flood-specific civil protection. Importantly, the project will provide targeted training on climate-induced FRM to over 100 practitioners and decisions makers, and will develop an institutional capacity development plan for the long-term development of capability and capacity in Flood Risk Management (FRM). The project will work closely with affected communities to introduce climate resilient community-based non-structural measures and provide training to local communities in climate resilient FRM. This will include the introduction of agro-forestry, community-based early warning systems, reforestation and introduction of financial instruments such as index-based flood insurance and credit deference schemes as a means of compensating for flood damages for agriculture.

The enabling environment will be enhanced by embedding climate change into key sector policies, strategies and plans to enable climate resilient flood risk management within sectors that impact flood risk significantly, including land use and spatial planning, forestry, agriculture and energy sectors. Specifically, the project will introduce floodplain management regulations that will enhance zoning of development and activities away from high risk areas.

Hence, the project will help the government of BiH and the population of the targeted region to develop adaptive capacity and embark on climate resilient economic activities.

Implementing Entity/Responsible Partners: Ministry of Spatial Planning, Construction, and Ecology of Republika Srpska, Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina

Programme Period:	2014-2018
Atlas Award ID:	00083690
Project ID:	00092036
PIMS #	5241
Start date:	April 2015
End Date	April 2020
Management Arrangements	DIM
PAC Meeting Date	TBD

Total resources required	82,260,000
Total allocated resources:	82,260,000
• Regular UNDP	1,500,000
• Other:	
○ GEF	5,000,000
○ Government	75,700,000
○ In-kind	
○ Other	
In-kind contributions UNDP	60,000

Agreed by (Government):

Date/Month/Year

Agreed by (Executing Entity/Implementing Partner): UNDP

Date/Month/Year

Table of Contents

List of Acronyms

ALM	Adaptation Learning Mechanism
AMAT	Adaptation Monitoring and Assessment Tool
APL3	Adaptable Program Loan 3
APR/PIR	Annual Project Review/Project Implementation Reports
ARDP	Agriculture and Rural Development Project
AWP	Annual Work Plan
BD	Brčko District
BiH	Bosnia and Herzegovina
BiHPOS	Bosnia and Herzegovina Positioning System
CAPRA	Central America Probabilistic Risk Assessment
CC	Climate Change
CCA	Climate Change Adaptation
CIS	Commonwealth of Independent States
CO	Country Office
CP	Country Programme
CP	Civil Protection
CPAP	Country Programme Action Plan
CRFRM	Climate Resilient Flood Management
CRM	Climate Risk Management
CRP	Centre for Development and Support
CSOs	Civil Society Organizations
CTA	Chief Technical Advisor
DEM	Digital Elevation Model
DG	Directorate General
DIM	Direct Implementing Model
DRR	Disaster Risk Reduction
EC	European Commission
ECLAC	Economic Commission for Latin America and the Caribbean
EIB	European Investment Bank
ERBM	Editorial Review Board Member
ERC	Evaluation Resource Center
ESCO	Energy Service Company
ESMF	Earth System Modelling Framework
EU	European Union
EUFD	European Union Flood Directive
EVA	Extreme Value Analysis
EWS	Early Warning System
FBiH	Federation of Bosnia and Herzegovina
FBUR	First Biannual Update Report
FDA	Flood Damage Analysis
FFEWS	Flood Forecasting and Early Warning System
FIA	Flood Impact Analysis
FM	Facility Management
FR	Flood Risk
FRM	Flood Risk Management
GDP	Gross Domestic Product
GEF CCA	Global Environment Facility Climate Change Adaptation
GEF	Global Environment Facility
GEF OFP	Global Environment Facility Operational Focal Point
GIS	Geographic Information Systems
GMS	General Management Support
GPS	Global Positioning System
GWh	Giga Watt Hour
HACT	Harmonized Approach to Cash Transfer

HE	Hydro Energy
HEC	Hydrologic Engineering Center
HIS	High-water Information System
HMI	Hydro Meteorological Institute
HMS	Hydrologic Modelling System
HP	Hydro Power
HPP	Hydro Power Plant
ICOLD	International Commission on Large Dams
ICP	Interstate Centre for Prediction
IDP	Irrigation Development Project
IDPs	Internally Displaced Persons
INC	Initial National Communication
IPA	Instrument for Pre-Accession Assistance
IPARD	Instrument for Pre-accession Assistance for Rural Development
ISDS	Integrated Safeguards Data Sheet
ISS	Implementation Support Services
IT	Information Technology
JJA	June, July, August
JU	Javna Ustanova (Public Institution)
KM	Convertible Mark
M&E	Monitoring and Evaluation
MoFTER	Ministry of Foreign Trade and Economic Relations
MSc	Master of Science
MW	Mega Watt
NGOs	Non Governmental Organizations
O&M	Observation and Monitoring
PAC	PAC Project Appraisal Committee
PAD	Project Appraisal Document
PDNA	Post-Disaster-Needs-Assessment
PDRNA	Post-Disaster Rapid Needs Assessment
PEB	Project Evaluation Board
PFRA	Preliminary Flood Risk Assessment
PGIS	Participatory Geographical Information Systems
PIF	Project Information Form
PIMS	Project Information Management System
PIUs	Project Implementation Units
PPG	Project Preparation Grant
PPR	Project Progress Reports
PRA	Participatory Rural Appraisal
PUC	Public Utility Company
QPR	Quarterly Progress Report
RCT	Random Control Trials
RCUs	Regional Coordination Units
RDB Sava	Regional Department for Basin Sava
REACT	Responding to Emergencies with Appropriateness Coordination and Timeliness
REC	Regional Environment Center
RS	Republica Srpska
RTA/HQ	Regional Technical Advisor/Headquarter
SBAA	Standard Basic Assistance Agreement
SCCF	Special Climate Change Fund
SDI	Spatial Data Infrastructure
SECO	Swiss Secretariat for Economic Affairs
SEEC	Catastrophe Risk Insurance Facility
SEEC CRIF	Southeast Europe and the Caucasus Catastrophe Risk Insurance Facility
SMEs	Small and Medium Enterprises
SNC	Second National Communication

SOF	Source of Funding
SON	September, October, November
SSM	Schade en Slachtoffer Module (damage and Victim Module)
TA	Technical Assistance
TORs	Terms of References
UK	United Kingdom
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNDP CCA	United Nations Development Programme Common Country Assessment
UNDP-EEG	United Nations Development Programme-Environment and Energy Group
UNECLAC	United Nations Economic Commission for Latin America and the Caribbean
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations International Strategy for Disaster Reduction
USD	United States Dollar
VRB	Vrbas River Basin
WB	World Bank
WBIF	Western Balkans Investment Framework
WFD	Water Framework Directive
WMO	World Meteorological Organization
WRF-NMM	Weather Research and Forecasting- Non-hydrostatic Mesoscale Model

1. Situation analysis

1.1. Climate change - induced problem

1. Bosnia and Herzegovina (BiH) is a middle income country with an estimated 3.8 million inhabitants. The 1992-1995 war has had a devastating impact on its human, social and economic resources, leading to enormous challenges of the post-war reconstruction and economic and social recovery. This challenge has been further compounded by the transition towards market economy requiring structural reforms and improved governance.

2. Due to the war time devastation and the unsuccessful transition of economy, a large part of Bosnia and Herzegovina's population still lives in poverty. According to the 2010 multi-dimensional Poverty Index introduced in the 2010 Human Development Report, it is estimated that in BiH 14.0 % of the population lives below the official poverty line, and worse yet, the intensity of deprivation amongst the poor is 37.2 %. The slow rate of the post-war economic recovery of Bosnia and Herzegovina has been compounded by the negative impacts of climate change on key sectors such as agriculture, energy (hydropower), the environment and, in particular, the frequency and magnitude of flood disasters, which have tripled in frequency in the last decade[1]. In 2010 - the second largest flood on record - damages were US$ 200 million which is approximately 1% of GDP. In May 2014, Bosnia and Herzegovina experienced its worst flooding in 150 years which resulted in 23 deaths and US$2.7 Billion worth of damages which is 15% of GDP. This will cause the economy to contract by 1.1 percent this year, compared to the growth of 2.2 percent that had been predicted before the flood. These estimates were made by experts from the EU, United Nations and World Bank along with local authorities immediately following the floods.

3. The most damaging floods have had devastating impacts on the most vulnerable groups including the rural poor, war returnees and displaced persons. Based on indicative information from local authorities, a significant proportion of the flood victims belong to one of these vulnerable groups. For example, in several municipalities in the Vrbas basin up to 100% of affected households have been identified as war returnees or displaced persons and are least equipped to cope with, and recover from floods[2]. This has led to a deepening of poverty in flood affected areas. The risk assessment report adopted by the Council of Ministers in 2011, emphasized that BiH is significantly exposed to the threats of climate change. Furthermore, the country has very limited capacity to adapt to address climate risks[3].

4. Both the BiH's Initial National Communication (INC) and the Second National Communication (SNC) to UNFCCC have identified that climate change is affecting Bosnia and Herzegovina, and will accelerate during the remainder of the twenty-first century. A more detailed summary of SNC climate change assessment is provided in Annex 4. According to the Localized Climate Models developed for BiH through the SNC4, the mean seasonal temperature changes for the period 2001-2030 are expected to range from +0.8°C to +1.0°C above the previous average temperatures, and further significant temperature increases are expected during the period 2031-2060, of between 1° C to 2° C in coastal areas, and 2° C to 3° C inland. Observed historical records show an increase of 1.2°C for the period 1961-2010, in line with predictions. The INC and SNC also predict that precipitation will decrease by 10% in the west of the country and increase by 5% in the east in the period 2001 to 2030. Rainfall extremes are also increasing and there are changes in the seasonality of rainfall with decreased precipitation during the spring and summer months (20%), and increased precipitation in the autumn months. The historical records show that the number of days with rainfall above 10.0mm has increased. These observations represent a change to the rainfall regime which, when combined with temperature increases, will result in less moisture in the soil (potentially increasing the frequency and magnitude of drought), and an

[1] Climate Changes and Water Management in Bosnia and Herzegovina with Special Focus on Flood Protection, Igor Palandzic, Sarajevo 2012, http://www.scribd.com/doc/112546672/KLIMATSKE-PROMJENE-I-VODNI-RESURSI-U-BOSNI-I-HERCEGOVINI-Climate-Changes-and-Water-Resources-in-Bosnia-and-Herzegovina

[2] It should be noted that there is very little statistical data on the number of returnee and displaced persons, who, by the very nature of their situation have been difficult to keep a record of. One benefit of this project will be specific assessment of vulnerability of these groups to climate change within the Vrbas basin.

[3] Risk assessment of vulnerability BiH to natural and other disasters, Ministry of security of BiH.

[4] Second National Communication of Bosnia and Herzegovina to the UNFCCC (SNC), 2013

increased likelihood of floods as the frequency of intense rain events increases. All of these impacts have been observed in the project target area – the Vrbas Basin – but the most damaging has been flooding.

1.1.1. The Target River Basin – Characteristics contributing to exposure and vulnerability

5. Vrbas river basin (VRB) is located in north western BiH and extends, fully or partially, throughout the area of 28 administrative municipalities within BiH, including: Bugojno, Donji Vakuf, Gornji Vakuf-Uskoplje, Jajce, Kotor Varoš, Laktaši, Kneževo, Kupres (RS), Šipovo, Dobretići, Jezero, Banja Luka, Čelinac, Mrkonjić Grad, Srbac, Glamoč, Kupres (FBiH), Gradiška, Prnjavor, Travnik, Novi Travnik, Vitez, Livno, Fojnica, Prozor, Ribnik, Teslić and Konjic. **Figure 1** shows the Vrbas river basin area in BiH.

Figure 1: Map of BiH showing the location of the Vrbas River Basin

6. The total area of the VRB is 6,386 km^2 which is 12.5% of the entire BiH territory, 63% of which is located in the Republica Sprska (RS) and 37% in the Federation of Bosnia and Hertzegovina (FBiH).The Vrbas River is a right tributary of the Sava River, which is in turn a right tributary of the Danube River, the second largest river basin by area in Europe. The Danube has recorded 8 of its largest flood events in the last decade. Sava River, and in turn Vrbas River, have consequently also been affected. The Basin is typified by mountainous relief, accounting for 90% of land area mainly located in the upper and middle sections. The remaining 10% of a lower, more mature river plain mainly located at Lijevče Polje and the Skopaljska Valley. There are relatively little lowlands (about 600 km^2) and they are located mainly in the northern part of the basin, at the mouth of Vrbas to River Sava, and in smaller part in narrow valleys along the main stream and tributaries. The most important tributaries are: Pliva, Ugar, Crna Rijeka and

Vrbanja which are in the central part of the basin and which drain significant karstic plateaux. In the upper and central part of the basin there are a larger number of karstic springs suitable for water supply, and the most important among them are the springs of Pliva and Janj. The karstic geology of these major tributaries means that flooding could be triggered by a combination of long-duration rainfall filling up groundwater stores which will eventually result in soils having low rainfall acceptance capacity, resulting in flooding.

7. The Vrbas Basin experiences seasonal floods in the spring (March - May) as a result of snow melt and late autumn (December) due to heavier rainfall. This combined with groundwater flooding puts the VRB at risk from multiple sources and from combination of all three (groundwater, rainfall and snowmelt). The lower part of the Vrbas River - from the confluence with the Sava River upstream to the bridge at Klašnice, meanders, and there is significant river bank erosion and deposition.

8. In the Vrbas River Basin (VRB), the climate change related impacts have already been observed. The effects have included increased frequency and severity of flooding in every year of the last decade. Records for the Vrbas basin for the last 10 years[5] show that major floods occurred during late spring (April and May 2004) and summer (June 2010), but also during late autumn (December 2008) and early winter (January 2010). This is noted also in the analyses performed in World Bank's Update the Basis of the Water Resources Management of the Vrbas River Basin[6], which showed that the problem of the seasonality of discharge in VRB has increased in recent years due to an increase in extreme discharge values and decrease in minimal discharges. The study also reports that in the last ten years, floods and droughts have occurred on a scale not previously recorded.

9. There is one hydropower dam on Pliva river (Veliko Plivsko lake), for the purpose of water supply for hydropower plant HE Jajce I. The second hydropower dam is on Vrbas with the function of water supply for hydropower plant HE Jajce II. These hydropower dams regulate flow on Pliva and the Vrbas and will therefore play a part in flood risk management.

10. There are many planned hydropower schemes for BiH, including in the VRB. The planned HPPs for VRB are mainly downstream from Bočac and major tributaries in the RS the Water Master Plan Revision of the Vrbas River Basin[7]) and the changes will only affect the regulation of water flow and water quality of the Vrbas River downstream from the village Delibašino selo. The exploitable hydropower potential of the basin in the RS is 1895 GWh or 59.2% of the total exploitable hydropower potential of the basin. So far hydropower facility, Bočac HPP, with an installed capacity of 110 MW, uses only 307 GWh or 16.2% of the potential.

11. According to the key strategy documents in the water sector in both entities, one of the methods of peak reduction applied in BiH is reservation of the space in the multipurpose water reservoirs and/or regulation of the regime of water reservoir built for other/multipurpose usage (e.g. energy). However reservoirs built originally to have multiple functions, are currently operated with power generation as the priority due to the lack of cooperation and strict regulation and control between flood management and energy sectors.

12. Under climate change, more frequent, intense rainfall events will lead to intensive runoff and increased peak river flows, when power production may not be possible due to potential (or actual) damage to infrastructure. The increased magnitude and seasonal variability of flood flows could also potentially place dams at risk of overtopping which could lead to dam breaks and catastrophic flooding. With increasingly variable river discharge predicted under climate change, there may be significant challenges for the hydropower sector which needs to be addressed through improved management of water resources at the watershed level. All HP dams on Vrbas (existing and future) are built to accommodate the 1 in 1000 year water level with security a level of 1.2-1.5. To date, floods have not resulted in any damages that have influence on dam stability. However, the risks associated with more extreme events and climate change have not yet been systematically considered in strategies and management plans for hydropower development.

13. With many planned hydropower schemes in the Vrbas and elsewhere in Bosnia, it will be important to ensure that climate change considerations including their impact on flood risk and their

[5] Data on flood damages collected from Vrbas River Basin Municipalities, UNDP 2013
[6] Update the Basis of the Water Resources Management of the Vrbas River Basin, World Bank, February 2012
[7] Update the Basis of the Water Resources Management of the Vrbas River Basin, World Bank, February 2012.

potential role in flood alleviation, are fully accounted for in their design and operations, and such approaches and methods are embedded into HPP scheme planning in BiH in the future.

1.1.2. Flood Hazard in the VRB – History of Flooding in the VRB

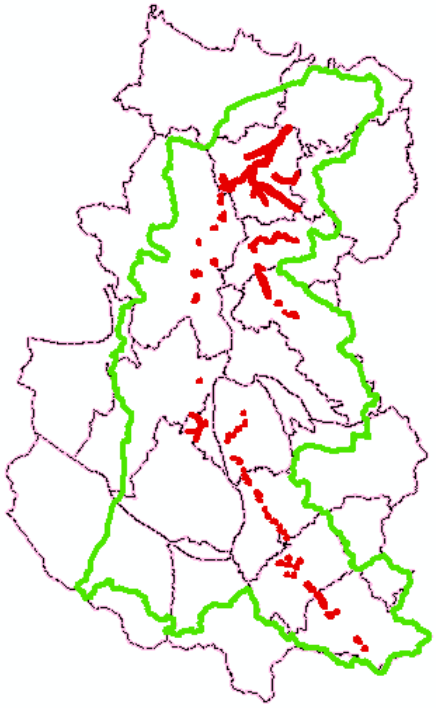
14. **Figure 2** shows that flooding in the VRB affects all parts of the basin. Of the 28 municipalities that make up the Vrbas basin, 13 have experienced flooding in the past decade. In the upper and middle parts, floods are mainly due to rapid rainfall running off of steep slopes, and rapidly melting snow. In the lower parts flooding is due to a combination of fluvial river flooding (river overtopping its banks), high groundwater levels in upper and middle parts resulting in rapid runoff to lower parts, and pluvial rainfall (high intensity rainfall unable to infiltrate the ground). Prior to May 2014, flooding had been mainly confined to the upper and middle catchment, mainly because flows to the lower catchment are regulated, to some extent, by the upstream dams. However, in 2014 the main flooding was to the lower catchment.

15. Prior to the start of the formal hydrometric record, flood events have been mentioned in historical records. For example, the great flood events which occurred on the rivers Sava, Danube, Drina and Miljacka. These include 1611, 1616, 1623, 1711/1712, 1759, 1783/1784, 1838, 1846, 1862, 1864 (floods throughout Serbia), 1876, 1878, 1882, 1888, 1895, 1897, 1920, 1926, 1932, 1937.

16. In April 2014, a total of 7 cyclones passed over the region resulting in very heavy rainfall and saturated ground. This period of unstable weather continued into May and between 14 and 18 May 2014, a low-pressure system designated "Yvette" or "Tamara" affected a large area of South Eastern and Central Europe, causing floods and landslides. Bosnia and Herzegovina and Serbia suffered the greatest damage, as the rain was the heaviest in 120 years of recorded rainfall measurements.

17. Based on the historical rainfall record at Banja Luka in the VRB, which starts in 1881, May 2014 was the fourth wettest May on record. Indeed since 1881 the monthly rainfall above 200mm in May was measured only in 1899 (267 mm), 1919 (247mm), 1897 (214mm), May 2014 (217,8 mm) and 1996 (203 mm).

Figure 2: Vrbas basin (green outline) showing observed flood polygons for the past 10 years (red polygons), overlain on municipality boundaries (purple polygons)



18. At Banja Luka, the highest recorded daily precipitation since 1961 was 156mm which had been assigned a return period of 1 in 1000 years, based on statistical analysis of the available record up to 2011. The average maximum daily rainfall for the same period in Banja Luka is 54mm. During the period 5 Apr to 20 May 2014, 424 mm of rainfall was recorded in Banja Luka. In May 2014, a record 107mm of rain fell between 13th and 17th May. The return period of the 2014 event has been roughly estimated as 1 in 333 to 1 in 500 year event[8] and could potentially be more extreme depending on the storm duration assessed. Indeed for some rain gauges in the catchment, the 3-8 days rainfall return period has been estimated at 500-1000 years (0.2% to 0.1). It is also worth noting that the return period of the river flow and level could be much larger than that of the rainfall as the antecedent soil moisture conditions were much higher than usual.

19. The May 2014 flood resulted in water levels in the Vrbas basin, exceeding the previous historical records of 687 cm by 12% to 21% at locations along the Vrbas main river and its main tributaries. The largest exceedance of previous levels was recorded in

[8] Based on an Extreme Value Analysis (EVA) using the historical rainfall record at Banja Luka for 1951 to 2014

the lower part of the basin and on the Sava. This is a change in the characteristics of flooding in the Vrbas basin which is normally in the middle and upper parts as well as the tributaries or where tributaries confluence with the main Vrbas. This flooding on the main Vrbas in the May 2014 event suggests that it is possibly due to soils in the upper catchment and tributaries providing no absorption or storage for the rainfall (due to groundwater storage being full from the previous weeks of rain) and routing the flood rapidly downstream to the main river. As discussed above, analysis of river flow and level data will need to be undertaken to confirm the true return period of this flood event.

20. The devastation caused by the 2014 event coupled with the fact that 4 out of the largest 8 rainfall depths have occurred since 2002, is evidence that precipitation is intensifying in magnitude and frequency of occurrence in the Vrbas basin, resulting in increasingly severe floods.

1.2 Vulnerability of Vrbas River Basin communities

21. The municipalities of the Vrbas Basin are among the worst war devastated municipalities in BiH, which, 18 years after the war, are still struggling to re-establish normal living conditions and to repair physical and societal war damage. Post-war societal issues are manifested in the form of deep ethnic divisions and mistrust. Despite these problems, many municipalities have successfully undergone ethnic reconciliation and reintegration, but are still struggling with the economic recovery.

22. The population of the Vrbas is approximately 510,000, based on 1991 figures, but current numbers could be as much as 627,000 or 16.52% of the total BiH population (of which potentially 51.325% are women, based on percentage for RS only). The average population density within the VRB is 72/km^2. The biggest urban centre within the VRB is Banja Luka city with 199,191 citizens and population density of 163/km^2, while some rural municipalities have a very low population density of <10/km^2. Approximately 35% to 40% of the total basin population is concentrated in and around the city of Banja Luka and downstream, while the remainder of the population lives in rural areas. Inhabitants over 65 make up 19.1% of the VRB total population, with 21.4% of women and 16.6% of men making up this age group. Population projections suggest that the percentage of the elderly population in urban and rural environments will increase, so that the percentage of the population able to work will gradually decrease. This is likely to result in increased social and health care requirements for the elderly. With respect to flood risk, an aging population places an additional requirement on the services to be provided during a flood event. In addition, there is a trend towards urbanisation with population density in the main cities increasing and rural populations decreasing. As cities expand, flooding and other environmental risks will be increased especially if expansion is rapid and unplanned. Such increasing risks are amplified with climate change. The ability to identify the hazards and risks ahead of the expansion will enable planners, development partners and disaster risk reduction experts to avoid costly disasters, and recover from disasters in the future. It will also enable governments to prioritise the integration of disaster risk reduction considerations into sustainable planning policies and programs.

23. One of the most significant consequences of the 1992 – 1995 war in BiH was the migration of the population. Over a million people left BiH and found their residence in the countries throughout the world, and the same number of people was displaced internally within BiH. Statistics of the Union for sustainable return and integration of Bosnia and Herzegovina from 2010 says that the number of returnees within the VRB totalled 86,078, up to 2010. The majority of returnees to the VRB are located in Jajce, Mrkonjic Grad, Donji Vakuf, Bugojno, Banja Luka and Kotor Varoš municipalities, which are flood prone municipalities.

24. Development indices show that all the municipalities in the FBiH located within the VRB are either particularly underdeveloped (i.e. development index < 50% of FBiH average) or insufficiently developed (development index 50-75% of FBiH average). According to information of the Federal institute for development programming from 2012, the municipalities of Jajce, Donji Vakuf, Glamoč and Dobretići, are particularly underdeveloped, while the municipalities of Bugojno, Gornji Vakuf-Uskoplje and Kupres (FBiH) are insufficiently developed municipalities.

25. The average number of the employed within the VRB for the period 2008 to 2012 is 97,574.9. This is 67.75% of the working age population (15-65 year olds), or an unemployment rate of 33.25%

[9] Data on the number of the unemployed are taken for the municipalities with over 70% of settlements/communities within the VRB.

which is higher than the state average unemployment rate of 27%[10]. Unemployment is highest among young persons aged 15 to 24 years and was 59.1%[11]. In the 13 flood affected municipalities in the Vrbas basin, the percentage of unemployed ranges from 30% to 86% (65% on average) where the percentage of returnees affected is up to 100%. Based on RS gender disaggregated figures, the average percentage of employed women is 44.5%. Economic activity in Vrbas basin includes forestry products, agriculture, food, textiles and leather products, mining, metallurgy and metal processing, chemical processing and electrical industry. The majority of the employed are in the processing industry (20%), 18% in trade, followed by 13% in the public administration, defence and mandatory social insurance, education 9%, health care 8% and civil engineering accounting for 5% of total number of employed.

26. In some sectors, the number of the employed has been decreasing from a year to year. This is mainly in agriculture, forestry and fishing, mining and quarrying and accommodation and food service activities. This is of importance because these sectors either impact on, or are impacted by flooding. The data does not exist to concretely provide a link to the decline in these sectors and increased flood risk or climate change impacts, and it would be important to study these trends to ascertain the reasons behind the observed changes. The vulnerability of the agricultural sector to climate change is certainly evident by declining production in the aftermath of major floods due to crop damage. This is discussed further under component 3 baseline.

27. Around a third of the rural population of Vrbas Basin (approximately 100,300 people) manage "smallholdings" where they produce fruit, vegetables and livestock products mainly for their own consumption, and about 16 % may be classified as "farmers", in that they manage at least 3 ha and/or 3 livestock units. Agriculture is therefore important to the Vrbas River Basin, and the direct impacts of climate change on agriculture such as floods and droughts will inevitably impact the rural communities without any adaptation. Under climate change there is a real risk of reduced crop yields leading to increased food prices, which would in turn have negative implications for food security.[12] The year 2012 represented the fourth consecutive year when agriculture suffered significant losses due to unfavourable weather. In 2012 the sector decreased to 6.24% of GDP from 9.24% in 2000[13]. The agricultural damages due to flooding for the last 10 years up to 2012 was been estimated at US$545,000 in Vrbas basin. Exact figures are unavailable for agricultural damage for the 2014 event, but the area affected was 5,225 ha. The impacts are experienced differently by men and women, due to their gender-based responsibilities in household management. Agricultural damages from droughts and floods have serious implications for the poor and vulnerable, as it negatively impacts on households and household budgets. Hence, adaptation approaches will need to focus on flood risk management which, while addressing flood risk, will not exacerbate drought risk, and if possible will provide attendant benefits to drought risk management. Importantly, adaptation measures should also take account of the different vulnerabilities of men and women.

28. The majority of the population (approx. 65%) living in the flooded areas of VRB is rural, which in Bosnia and Herzegovina is on average much poorer than urban population and 17% are returnees or displaced persons who are among the poorest in BiH. UNDP's Household Budget Survey in 2007 found that 23.9 % of rural households were poor, compared to only 11.0 % of urban households. Overall, per capita GDP in rural areas averages 4,780 KM (USD 3,186), which is 43% lower than the urban value of 8,360 KM (USD 5,573). The Rural Household Survey (2012) found that the average total household income in rural areas of BiH was 767 KM (USD 520) per month, which, when compared to the minimum monthly income requirement for a family of 3.4 (1,100 to 1,400 KM (USD 680-950) suggests the rural population is living on the edge or in poverty. Furthermore, there is a large proportion of rural households, almost 25%, earning only 200-400 KM (USD 133 - 267) per month. Indeed, almost 90 % of the rural households in the survey declared a monthly income below the calculated "family consumption basket" of 1,370 KM (USD 913). It still appears that a lot of rural households are living in or near poverty, and the only way for them to secure subsistence and partially compensate for the income lower than the minimum

[10] Thematic Bulletin " Labour force survey 2013"-Preliminary results, Agency for Statistics of Bosnia and Herzegovina, Sarajevo, 2013.
[11] Ibid
[12] Trbic. G., Vojinovic. DG., 'Impact of Climate Change for Food Production in the Western Balkan Region: Study of impacts of climate change for food production in Bosnia and Herzegovina', REC Country Office Bosnia and Herzegovina, 2010. Research has demonstrated that the recent droughts caused a significant reduction in maize yields in Bosnia and Herzegovina.
[13] First release, Gross domestic product of BiH in 2012,year XII, no VI, Agency for Statistics of Bosnia and Herzegovina, Sarajevo, 2013.

required to stay out of poverty are the savings created through their own small scale, subsistence farming. Women are paid about 20%14-46%[15] less than men.

29. Empirical evidence, based on reports from all 13 flood-prone municipalities of the VRB, shows clearly that all of the municipalities have during the period 2003-2013, experienced major flooding which resulted in damages estimated at over USD 31 million **(Table 1).** Over the period floods have directly affected five of the area's biggest urban centres, over 130 rural communities and villages flooding 9,368 households, 150 social buildings, and 84 businesses. Over the period, several of the municipalities have reported direct flood damages in range of 40-100% of their annual budgets, while there were cases when the damages exceeded municipal budgets several times (e.g. Municipality of Jajce, damage from floods in March 2004 was 2.45 times bigger than that year's municipal budget; Municipality Kotor Varos, floods in June 2006 resulted in damage 3.4 times bigger than the municipality's budget). In 2004, approximately 2,300 households within 7 municipalities in the Vrbas river basin were affected by flooding, which resulted in approximately USD 12 million in total damages. The December 2010 flood event affected 4,914 households and buildings, and resulted in USD 13.6 million in damages in VRB.

30. Preliminary estimated figures for damages sustained during the 2014 flood event have been collected, and are presented separately in Table 2 below. Based on the figures it is clear that the total damages of 131.7 Million KM or $88.5 Million USD far exceeds the damages sustained in floods for the entire period 2003 – 2013, making this the most devastating single flood event in BiH history. The impact included deaths, damage to infrastructure including more than 4 Million KM or $2.7 Million USD damages to roads and the destruction of 26 bridges. Over 5,400 houses were flooded (of which 216 were completely destroyed), 322 households evacuated and more than 20,000 people affected. In Srbac and Banja Luka municipalities with more than 1400 businesses were affected. Throughout the basin, over 1,000 agricultural households (subsistence) were also affected and while exact agricultural damages are not yet available 5,355 ha of agricultural lands were flooded. In addition the floods triggered more than 184 landslides.

31. Based on **Table 1**[16], the three worst affected municipalities between 2003 and 2013 were Laktasi, Gornji Vakuf-Uskoplie and Bugojno in terms of the numbers of households affected, while Kotor Varos sustained the largest damages. For the May 2014 flood event, the three main municipalities affected were Banja Luka, Laktasi and Celinac both in terms of damages and numbers of people affected. The 4th and 5th worse affected were Kotor Varos and Jajce. Damages in Banja Luka, Laktasi and Celinac were mainly to commercial properties and this includes business disruption costs. Agricultural damages were highest in Laktasi and Srbac in the lower parts of the catchment where there are large agricultural interests in the floodplain.

[14] Impact of the crisis to salaries in Bosnia and Herzegovina, International Labour Organisation, Budapest, 2011.
[15] Somun-Krupalija, L.,: "Gender and Employment in Bosnia and Herzegovina - A Country Study", International Labour Office, Geneva, December 2011.
[16] Data collected during PIF preparation using questionnaires an interviews with municipalities

Table 1: Flood Damages for the period 2003-2013

FLOOD DATE (month / year)	Total number of households affected by flood	Percentage of unemployed people in the affected area (%)	Returnees / IDPs / Refugees	Small agricultural producers	Other social categories	Intervention costs of the municipalities during flooding and reconstruction (USD)	DAMAGES TOTAL (USD)	Average damage as % of municipal budget per flooding event
SRBAC	-	-	-	-	-		$2,000,000	more than 100%
BANJA LUKA	-	-	-	-	-		$2,896,415	5%
LAKTASI	1,213	35	676	544	515	63,243	$1,353,029	20%
MRKONJIĆ GRAD	52	86	1	14	-	-	$573,333	15%
BUGOJNO	430	-	56	314	116	-	$1,848,947	-
DONJI VAKUF	163	60	1	110	-	78,039	$389,776	10%
GORNJI VAKUF - USKOPLJE	736	50	1	100-130	-	108,576	$3,986,837	70%
KOTOR VAROŠ	380	-	-	21	-	3,664	$6,157,784	185%
JAJCE	250	65	-	187	-	157,435	$8,751,536	75%
KNEŽEVO	-	-	-	-	-	-	$302,803	10%
ČELINAC	-	-	-	-	-	-	$3,064,273	35%
						Total	$31,324,733	

Table 2: Preliminary figures for the 2014 flood

Municipality	Estimated damage (in KM)	No. of deaths	Flooded households	People affected	Total damaged households	Evacuated households	Evacuated people	Bridges destroyed	Roads	landslides damaged houses
Banja Luka	67,400,000	0	2469	7600		200	100	4	Assessment in process	7
?elinac	13,000,000.00	0	650	4000	110		550	5	several roads	10
Jezero	153,500.00	0	100	500	30	100	400	1	10 local roads seriously damaged	5
Kneževo	1,200,000.00	0	2	0	0	0	0	0	600,000.00 KM	12
Kotor Varoš	5,027,200.00	0	200	300	5	50	50	15	1,800,000.00 KM	22
Laktasi	25,428,320.00	0	1400	7000	200		600	1	500m	70
Mrkonjic Grad	240,000.00									
Šipovo	70,000.00		20						50km	
Srbac	15,000,000.00	1	500	1	10			0	10,000.00KM	0
Donji Vakuf	173,000.00	0	7	500	1		5	0	1.5Km	1
Gornji Vakuf	0	0	0	0	0	0	0	0	0.00 KM	1
Jajce	4,000,000.00	0	50	200		21			1,135,000.00 KM	54
Bugojno		0	60	120		1			one road, 20 m	2
Total	**131,692,020**									

32. In all of the municipalities reviewed, the level of compensation paid against the estimated damages to the flood-affected families and businesses for the period 2003-2013 is below 10%. Most of it is paid by municipalities in the form of immediate emergency response and relief, and later repairs of

roads, bridges and other damaged social infrastructure, but in practice the financial support from cantonal, entities and state authorities is minimal and in some cases, almost non-existent.

33. In general the direct consequences of the flooding in the Vrbas basin are multiple and include: damages to the housing stock, damages of infrastructure and lower economic output, especially in agriculture. In the 2014 flood, commercial damages were also significant, due to the types of economic activities in the main affected municipalities. All of these negative consequences have direct negative effect on livelihood of the individual households and people of the VRB area. The negative effects on livelihood are manifested either directly, through (i) the increased expenditures for individual households on repairs of damaged houses, agricultural buildings/facilities and infrastructure, and (ii) reduced incomes and savings from their agricultural production; or indirectly through the (iii) reduced availability of funding for social protection and welfare at the municipal/cantonal level due to the need to redirect the already scarce public budgets to cover the priority repairs of social buildings and infrastructure. Loss of commercial revenues and disruptions to business continuity can also have a direct impact on local GDP and more directly on livelihoods.

34. In all municipalities, the exposure and vulnerability of the communities described above is further exacerbated by the uncontrolled and unplanned development on the floodplain and other adverse land use practices that affect flooding such as uncontrolled mining of aggregates from river beds and banks, and inappropriate and unsustainable agricultural activity on high risk land. This is mainly due to the lack of land use legislation and policies specifically addressing flood risk under climate change.

35. The dependence of the area's rural population on the individual small scale subsistence agricultural production, exacerbated by non-resilient and un-sustainable farming practices, coupled with the lack of knowledge and funds to adopt new climate resilient farming techniques increases the exposure of the rural population of the Vrbas Basin to the effects of climate change which will result in increased agricultural damages in the future.

36. Considering all of the above, it is likely that repeated floods in VRB will increase vulnerability of the socially excluded and most vulnerable groups and increase the risk of the rural population falling back to poverty. During the project preparation stage, more detailed surveys were undertaken, to fully define vulnerability of the VRB basin, as discussed above and to ensure that the climate resilient flood management measures take full account of the vulnerability. It should be noted however, that one barrier to assessing the risks and vulnerability is the lack of systematic socio-economic data required for flood risk and vulnerability assessment. This barrier will need to be addressed in the long-term, in order to ensure that intervention measures benefit the most vulnerable groups in the basin, and it is the subject of output 2.2 of this project.

1.3 Existing legislative, policy and institutional framework related to water and flood risk management in BiH

1.3.1. Relevant national/entity institutional and legal frameworks

37. Bosnia and Herzegovina is politically decentralized and comprises two governing Entities, the Federation of Bosnia and Herzegovina (FBiH) and the Republika Srpska (RS), with Brčko District (BD) as a de facto third entity. The State of Bosnia and Herzegovina is the central authority, but has only limited and specific powers with regard to the water sector and environmental protection: the Ministry of Foreign Trade and Economic Relations (MoFTER) has water-related competencies at the level of Bosnia and Herzegovina. Due to the lack of a State-level framework and the constitutional character of BiH and its entities, the current state of affairs is complex and heterogenic, especially as the responsibilities for water management rest with the entities. An analysis of the BiH constitutional and legal framework indicates that it does not contain specific and clear principles that should guide the constitutive elements of the State in their management of shared water resources (i.e. those intersected by entity or district borders). The State-level authorities therefore have no responsibility for regulating these inter-entity relations.

38. The legal framework is not unified across the country and there are certain discrepancies in legislation between Entities (FBiH and RS) and even among Cantons within FBiH. The two Entities and the Brčko District have relevant political, administrative and legal jurisdiction in their own territories, but

the level of coordination and cooperation among them is not as high as it should be. Furthermore, the Federation of Bosnia and Herzegovina is divided into 10 Cantons which have their own authorities (ministries) with responsibilities in the water sector, including adoption of their own relevant laws. This complex administrative structure results in a number of different institutions in charge of water management issues and increases the need for coordination at the BiH level.

39. The reform of the water sector has led to the adoption of new water legislation. According to the new Water Laws, Entity Ministers (Federal Ministry of Agriculture, Water Management and Forestry in the Federation and Ministry of Agriculture, Forestry and Water Management in the Republika Srpska) are responsible for the preparation of Entity strategies for water management. The entity River Basin District Agencies are in charge of water management and monitoring, as well as the preparation of water management plans.

40. In terms of flood protection, some steps have been taken in preparing strategic documents and plans. For example, IPA project "Support to Water Policy in BiH (Dec 2009 – Dec 2011)" supported development of a Sub-strategy for the implementation of the EU Flood Directive (2007/60/EC). Full implementation of the EU Directive 2007/60/EC on the assessment and management of flood risks is expected by 2017.

41. The main documents in the field of water management are the Water management Strategy in FBiH (2010-2022, adopted 2011) and the Framework Plan of Development of Water Management of the RS and the implementation Action Plan in RS. The Framework Plan defines the criteria, conditions and obstacles for further development of the water infrastructure and management of the entire water sector, covering the planning period 2007 - 2016. These Entity strategies should be coordinated and harmonized, as much as possible, in order to provide an aligned BiH-wide strategy.

42. In order to implement these strategic papers and programmes, water management plans for river basins were planned to be adopted by the water agencies by 2016 for FBiH and 2015 for RS which seems at this moment to be unrealistic. These plans, among other issues, will deal with protection against the detrimental effects of water, protection from erosion, defence against ice, and drought control. They are to be revised and updated every six years. The working plans for the preparation of a water management plan are to be announced to the public at least three years before adoption of the plan. So far only Sava river basin plan (within International Sava Commission http://www.savacommission.org/srbmp/en/draft) is in public consultation phase.

43. In addition to direct water management and flood protection legislation, several other sectors that have a direct impact on flood risk management, or are impacted on by flooding, also need to be considered. Annex 11 provides a detailed analysis of existing sector-specific legislation, policies and plans for the spatial planning, agriculture, energy and forestry sectors, all of which impact in flood risk in the Vrbas basin. Spatial planning legislation and development control does not take account of flood risk or the use of zoning to reduce flood impact. Poor enforcement of existing weak development control rules has resulted in development in the floodplain. Flood defences strategies are based on traditional hard measures and do not consider combined structural and non-structural measures to manage floods. Spatial planning does not effectively deal with sediment management particularly river bed and bank mining practices which exacerbates flooding. The agricultural sector is the heaviest flood impacted sector, yet it does not include flood risk consideration in the zoning of agriculture. Agricultural infrastructural is at risk of flooding and missing the opportunity to provide attendant benefits to flood protection by considering flood risk in irrigation and drainage planning. For the energy sector, the main issue of the policies related to HPP dams in terms of planning, and operation which do not take account of flood risk under climate change. Strategic plans of forestry do take into account adverse effects of degraded forests which cause reduced positive hydrological role of forests (reduction of erosion). However, in reality, water and physical planning sectors and forest sector are often in conflict due to lack of legislation / regulation enforcement as well as lack of efficient inspection. Therefore it is necessary to establish mechanisms for active cooperation of these sectors in legislation and inspection enforcement and in harmonization of their objectives

44. In general, there is a lack of cross-sectoral policies, strategies and plans and this is a key barrier to effective flood risk management. Furthermore none of these sector plans currently takes account of climate change in their formulations. Thus the legislative framework does not enable effective flood risk management.

45. The early warning and disaster risk reduction (DRR) system is also fragmented. Different administrative units (entities and cantons) develop their own laws, strategic documents and policies regarding civil protection. DRR priorities are rarely outlined specifically. Rather, they are included in various sectoral mandates at different levels. The Federation of Bosnia and Herzegovina issued several laws related to DRR, such as the Law on Spatial Planning and Land Usage (which requires the inclusion of data about areas prone to natural and/or man-made disasters/catastrophes in spatial plans, but does not mention risk assessments or vulnerability mapping as prerequisites). Amongst others, Republika Srpska has strengthened its enabling environment for DRR through the Law on the Regulation of Space issued by the Ministry of Spatial Planning Construction and Ecology, and the Law on Water, which outlines preventive measures to be taken to protect people and material goods from potential damage caused by floods or erosion of water surfaces, including a risk and vulnerability assessment of the relevant areas.

46. The Early Warning System (EWS) in practice is, however, fragmented and inefficient. When a flood has been forecasted, data are submitted to Sava water agencies by both water agencies (Water Agency for Sava River in FBIH and JU "Vode Srpske in RS) on a daily basis from all stations. When water levels reach the predefined threshold level for which emergency state has to be declared, the data are submitted every four hours until the emergency has ended.

47. When there is no emergency situation, Federal Hydro-meteorological Institute is obliged to report weather forecasts on a monthly basis, based on statistical data and models like WRF-NMM 3.5. In contrast, when an emergency situation arises, data on water levels in the reservoirs, including inflow and outflow of the reservoirs is available on a daily basis, and/or every four hours. In addition, within their operating licenses, for the purpose of flood management, all HPPs have set water levels in reservoirs for the various seasons. So in wet periods when rain is expected water reservoirs should provide sufficient available storage to be able to receive expected flood volumes. If users of a reservoir possess their own hydrologic and/or meteorological stations and remote-sensor information system, they are obliged to the agencies with access to such data in case of emergency.

48. After receiving the information, the center forwards the information to the relevant authority or to the appropriate agencies (e.g. water agencies) and institutions. In case of cross border situations, the information is transmitted to the corresponding centers in the other entity or Brcko District and in case of an international event, to the Operational and Communicational Center in the Ministry of Security BiH, responsible for further early warning communication with neighbouring countries. For cross-border flood events with the possibility of negatively impacting BiH, the flow of information goes through the same channels, but in the opposite direction.

49. In accordance with the Framework Law on the Protection and Rescue of People and Property in the Event of Natural or Other Disasters in BiH Operations and Communications Centre-112, which works 24 hours/7 days a week, was established within Ministry of Security of Bosnia and Herzegovina to continually collect the data on all types of phenomena and hazards that may lead to a natural or other disaster. The Centre-112 acts as an operations-and-communications connection hub in the international protection and rescue communications system and is linked with the centers in neighbouring and other countries, international institutions and organizations. It is also functionally linked and exchanges continually information with the operations centres of the relevant entity-level institutions and the institutions of Bosnia and Herzegovina. The Centre is equipped with modern IT and other equipment, creating all the necessary preconditions for performance of the functions provided for by the Law.

50. Implementation of the aforementioned legal obligations of information sharing is not always adequate and could be improved. In addition, this communication route for early warning is too long and could be detrimental to providing the early warning in time. During the May 2014 flood the operating centre played a very important role and was able to assess the level of emergency regardless, across administrative borders within country (entity, cantonal, municipal). However, this process could be enhanced with centralized, computerized systems that link automatic hydrometric observations and forecasts to a forecasting model, and disseminates automated warning information across entities and other boundaries, in real time.

51. Civil protection organization in B&H consists of four established organizational and managerial levels, namely:

- State level (Ministry of Security - Sector for Protection and Rescue);

- Entity level and Brcko District (Federal Administration of Civil Protection, Administration of Civil Protection of Republic Srpska and Department of Public Safety of Brcko District);
- Cantonal Administrations of the Civil Defence; and
- Municipal Administrations of the Civil Defence.

52. There is no civil defence headquarter as a management body at the state level, but the Coordinating Body of BiH which is responsible for coordination of the civil protection activities. An additional obstacle in coordination between entity civil protection units is the fact that Federal Administration of Civil Protection reports to the FBiH Government, while in the RS it comes under Ministry of Interior.

53. RS developed a plan of protection and rescue in 2003, while the Federation of BiH adopted its plan of protection and rescue in 2008. Brcko District does not have its own plan, yet various measures can be found in laws issued by individual ministries, e.g. the Law on Food, the Law on Healthcare, etc. The Civil Protection Plans of the Federation of BiH and RS contain similar elements in mobilisation and operational plans and preparedness measures. According to studies conducted by the Ministry of Security of BiH, inter-agency plans conducted at lower levels of organisation (entities, cantons and municipalities) are dysfunctional. The Sector for Prevention and Rescue within the Ministry of Security is making efforts to create a unified methodology for the preparation of planning documents at the state level and to provide adequate guidance on their content, in order to establish a coordinated system of plans for preparedness and activities at the interdisciplinary multi-organisational level. There is a potential here to embed Climate Change considerations into this unified methodology at state level, including the use of hazard maps based on climate change considerations in the development of emergency response plans.

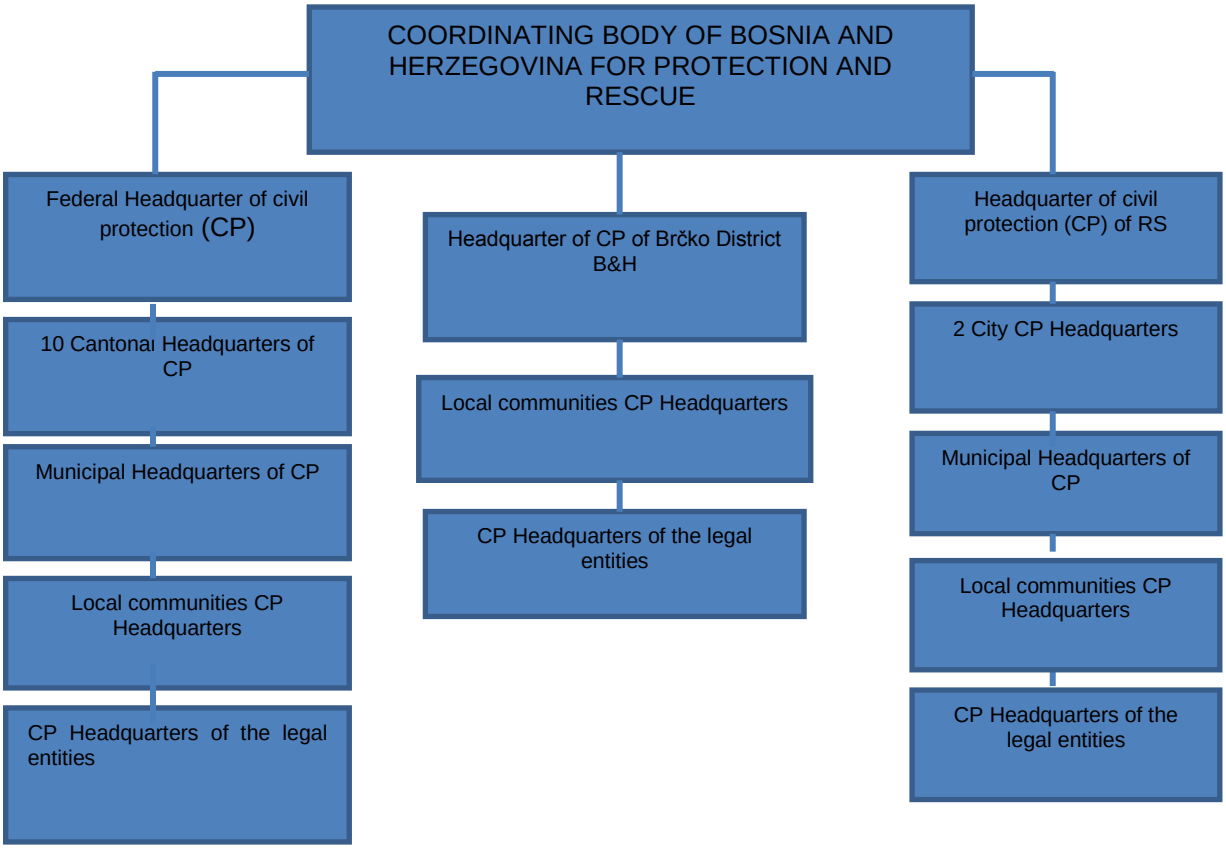


Figure 3: Civil Protection Organizational Structure for BiH

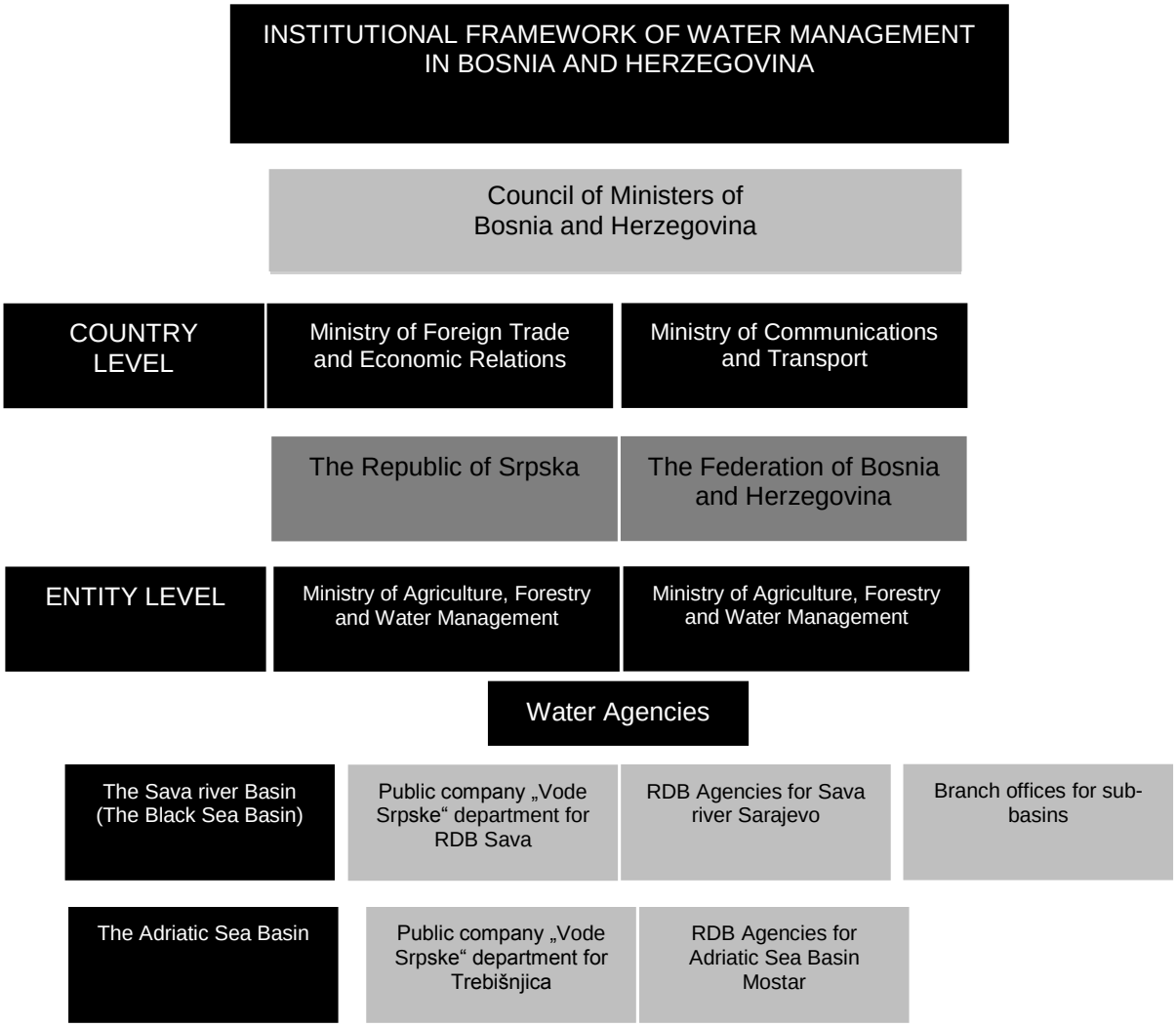


Figure 4: Institutional framework for water management in BiH

54. The water management institutional framework is fragmented too and lacks vertical and horizontal cooperation (**see Figure 4**). At the state level, the system for civil protection is headed by the Ministry of Security through the Sector for Protection and Rescue. It leads policy design. However, because of the decentralized nature of the system, the brunt of the responsibility for measures taken to deal with protection and rescue is placed on the entities and Brcko District. The Ministry of Security and the Coordinating Body of BiH (composed of the Council of Ministers, five representatives from the Federation of BiH, five from RS and two from Brcko District) take the leading role only in the event of a large-scale accident with trans-boundary effects or which cannot be resolved at the entity level. Local governments lack capacity and resources to fulfil even basic DRR functions.

55. Civil protection centres are organised on municipal, cantonal and entity levels. There is an emergency warning centre being organised on BiH (country) level, but it is still not in operation. Split responsibilities in the past have already led to artificially triggered floods (e.g., Neretva 1999 when lack of coordination among various electricity agencies provoked confusion resulting in unwanted opening of the gates on some dams).

1.3.2. Current Institutional Capacity

61. The FBiH Water Management Strategy (2010-2022, adopted 20/12/2011) undertook an analysis of existing staff (human resources) in the water sector, which showed that there is a lack of certain key experts, mainly multidisciplinary teams (staff) in the water sector (water legislation, water economy, ecology and other experts), with the capability for implementing management practices in accordance with WFD. According to that on cantonal level work at this moment 30 employees. Estimated needs are 57.

62. On entity level in FBiH current number of employed and designated is presented in table below.

Table 3: The personnel structure status in the professional institutions at the level of the FBiH

Institution	Technical Personnel according to the job	
	Current status	Designated
Ministry of agriculture, water management and forestry[17]	12	19
The Sava River Basin District Agency	37	58
The Adriatic Sea River Basin District Agency	20	37
Federal Hydrometeorological Institute Sarajevo	6	11
Federal institute for Agropedology Sarajevo	10	31
Federal Institute for Geology Sarajevo	18	29
TOTAL:	103	166

63. In RS there are an estimated 140 employees employed in “Vode Srpske” central office in Bijeljina and its’ five sub-offices in Banja Luka, Doboj, Trebinje, Prijedor and Zvornik. Other institutions presented and needed human capacities are presented in table below:

Institution	Current status	Designated
Ministry of Agriculture, Forestry and water Management –Water department	3	5
Public Institution “Waters of Srpska”	140 (estimated)	-
RS Water Inspectorate	8	10
RS Hydro Meteorological Institute	66	97
RS Institute for Agro Ecology and Soil (within Faculty of Agriculture Banjaluka)	12	-

64. Within Ministry of Foreign Trade and Economic Relation of BiH sits the department for Natural resources which is in charge for coordination activities among entities and reporting and communication with other countries. There are currently 6 employees in the water management division. IPA 2008 project “Strengthening of Bosnia and Herzegovina's Environmental Institutions and Preparation for Pre-accession Funds”, which will end in November 2014. is expected to estimate the required human capacities for the Natural resources department.

65. Historically, flooding in Bosnia and Herzegovina was dealt with mainly by the construction of flood defences and this is where current capacities lie. However, throughout BiH and in the Vrbas river basin, flood defences were severely damaged during the war and have remained in a poor state of repair due to limited budgets for maintenance of flood defences. Many structures now fail to meet their design

[17] Report on agriculture for BiH za 2011. Issued by Ministry of foreign trade and economic relations in BiH, May 2012.

standards of protection due to the increased magnitude and frequency of large flood events in the last 10 years. During the last decade the damages incurred from flood and flash-floods was USD 31 million in the VRB, while the cost of flood protection and rehabilitation works has doubled, including due to intensified processes as a result of climate change. Few significant new flood defence structures have been built since 1998. Hence, capacities and skills in the design of structural measures need to be upgraded to include new technologies and methods.

66. Furthermore, due to this preference for structural measures there is little knowledge about non-structural measures and limited capacity to design and implement them. Hence there is currently no strategic integrated flood risk management approach in BiH that identifies the best combination of structural and non-structural measures to address climate induced flood risk.

1.4. Long-term solution and barriers to achieving the solution

1.4.1. Preferred Solution

67. In response to the mounting climate change-induced risk exacerbated by anthropogenic factors and vulnerabilities in the Vrbas basin, BiH needs to ensure that it implements adaptation technologies that enable a flood risk management approach which is based on a well-developed knowledge base of flood risk. Such an approach should include strategies for the avoidance of flood emergency situations through effective climate resilient spatial planning, the mitigation of the flood damage and loss through the implementation of sustainable climate resilient intervention measures, and the introduction of a unified monitoring, forecasting, early warning and emergency response system. Such an approach should ideally be underpinned by the development of regulations and policies to ensure adequate cross-sectoral enforcements as well as a coordination mechanism which would enable coordination between Entities and between Entity and State level. It will also require any legislative and policy framework to fully embed climate change considerations, something which is currently missing in BiH.

68. Support needs to target the most vulnerable groups of society, as well as government at all levels to undertake direct adaptation measures; those that minimize the exposure of people and economic assets and ensure that potential damage is limited to acceptable levels. BiH also needs to strengthen the early warning system for these events that are likely to escalate both in frequency and intensity as a result of climate change. In addition, BiH needs to strengthen its technical capacity to assess and manage flood risks, and ensure that such management measures are aimed at adaptation to climate change. This will include the development of flood risk management tools and methods that take full account of climate change considerations and that enable the development and design of sustainable, climate resilient solutions. Importantly, the affected communities in the Vrbas basin will need to be fully engaged and empowered to participate in the adaptation measures for the basin.

1.4.2. Barriers

69. Towards achieving the normative solution there are several barriers to be addressed. Barriers associated with each outcome are summarised in **Table 4** below, and elaborated for each output in Annex 10.

Table 4: Barriers to overcome for each project outcome

Expected Outcome	Barrier
Component 1 - Enabling environment for climate risk sensitive water and flood management	
Key relevant development strategies/policies/legislation integrate climate change-resilient flood management approaches	A lack of a comprehensive legislative and policy framework for strategic water and flood risk management, to respond to climate change risks; Fragmentation and gaps in policies and national regulations for long-term flood risk management under climate change
Component 2 - Technical and institutional capacity for transferring climate resilient flood management technologies and approaches	
Climate resilient flood risk management is enabled by transferring modern technologies and strengthening institutional capacities	Lack of institutional capacities, technologies, equipment, data and tools for hazard, vulnerability, damages and loss assessments on which climate resilient flood risk management can be based
Component 3 – Climate resilient flood management technologies for vulnerable communities in VRB	
New technologies and approaches for enhanced flood risk management applied to increase resilience of vulnerable communities in VRB	Lack of community level resilience technologies and adaptive strategies to minimise flood impact, including lack of a comprehensive and unified flood forecasting, early warning and response system to increase community resilience.

1.4.3. Expected results that the project will work towards

70. SCCF funds will be used to transfer adaptation technologies for climate resilient Flood Risk Management. This will include the development of state-of-the-art hydrological and hydrodynamic models for the VRB, which incorporate climate change predictions and produce flood hazard maps as the basis for spatial planning and long-term strategic FRM. A further area of technology transfer will be the development of a GIS-based vulnerability loss and damages assessment tool, and importantly a systematised approach will be embedded, to enable the ongoing collection, storage and analysis of socio-economic data. An important aspect of technology transfer will be the upgrade and rehabilitation of the hydrometric network, and the harmonisation and centralisation of the hydrometric database. The project will also develop the flood forecasting system and enhance the existing early warning system within the VRB which will be underpinned by the centralised hydrometric database. Emergency response will be enhanced through the development of emergency response plans, and provision of training in flood-specific civil protection.

71. The project will provide targeted training on climate-induced FRM to over 100 practitioners and decisions makers, and will develop an institutional capacity development plan for the long-term development of capability and capacity in FRM. The project will work closely with affected communities to introduce climate resilient community-based non-structural measures and provide training to local communities in climate resilient FRM. This will include the introduction of agro-forestry, community-based early warning systems, reforestation and introduction of financial instruments such as index-based flood insurance and credit deference schemes as a means of compensating for flood damages for agriculture. The project will work directly with farmers to identity farm-level risks and vulnerabilities with respect to flooding and work to embed climate resilience measures to agricultural practises at the farm-level.

72. The enabling environment will be enhanced by embedding climate change into key sector policies, strategies and plans to enable climate resilient flood risk management within sectors that impact flood risk significantly. The sectors will include land use and spatial planning, forestry, agriculture and energy sectors. Specifically, the project will introduce floodplain management regulations that will enhance zoning of development and activities away from high risk areas. It will also introduce climate resilient building codes for construction in flood risk areas. The project will enhance land use policies related to activities that significantly impact on flood risk including aggregate mining of river beds and banks.

2 Strategy

2.1. Country ownership: country eligibility and country drivenness

2.1.1. Country eligibility and country drivenness

73. Bosnia and Herzegovina (BiH) became a member of the United Nations Framework Convention on Climate Change (UNFCCC) on December 6, 2000, and the Kyoto Protocol was ratified on April 22, 2008. Following the ratification of the UNFCCC, BiH has made a serious effort to establish appropriate political, institutional and legal frameworks to meet the commitments under the convention. The INC was submitted to the Convention in May 2010 and SNC in Nov 2013. BiH is currently in the process of developing its First Biennial Update Report which shows its further readiness to deal with climate change issues.

74. Authorities of Bosnia and Herzegovina and the various domestic stakeholders are very motivated to support and implement the project as climate change adaptation and flood risk management issues are becoming very important for the country's further development. Further integration of climate changes into sectoral strategies is seen as a way towards sustainable development of the country.

75. Responsible partner institutions (Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina, Ministry of Spatial Planning, Construction, and Ecology of Republika Srpska / UNFCCC focal point, Ministry of Agriculture, Water-Management, and Forestry of Federation of BiH, Ministry of Agriculture, Forestry, and Water Resources of Republika Srpska and Ministry of Environment and Tourism of Federation of BIH) are highly motivated to contribute to project implementation and generate ownership on planned activities and resulting outcomes due to continuous flooding in BiH and lack of capacity in BiH's institutions to cope with climate change impact and planning and executing adaptation measures. Strong motivation from all government level (state, sub-national and municipal) has been even more expressed after May 2014 floods.

76. Recognizing urgent needs to address, align and integrate climate change and flood risk management in Bosnia and Herzegovina after the 2010 floods, and communicating the requirements from sub-national level authorities, the project idea, concept note, PIF and the Project Document have been fully supported by the BiH's GEF OFP. Endorsement letters have been issued for each required stage within the project development process.

77. BiH is well aware of present economic and environmental consequences of climate changes, as well as a need to take a strategic approach with strong government ownership in order to reduce risk and vulnerability of society and economy. The first step taken is adoption of the Climate Change Adaptation and Low Emission Development Strategy (hereinafter referred to as Strategy) in Oct 2013. The Strategy identifies seven priority sectors to combat climate changes with water management underpinning many of the activities. Activities elaborated in this project document have derived from and are fully supported by the Strategy. Further evidence of country's seriousness and strategic attitude towards climate change adaptation lies in the fact that the activities identified in the Strategy originated from INC and SNC which clearly point out a need for technology transfer and a need to reduce risk to disaster.

78. Overall, this project will contribute to the efforts of the programme priority related to sustainable management of environmental resources, specifically to UNDAF Outcome 5. In addition, and having in mind its integrated nature, the project will also contribute to achievement of UNDAF Outcome 3, concretely with regard to disaster and climate risk management measures. It will increase government's capacity to reduce environmental degradation and promote sustainable resource utilization by taking effective actions in the area of climate change adaptation. Technology transfer for climate resilient flood management will certainly contribute to this Outcome.

2.1.2. Stakeholder Baseline Analysis

79. The list of stakeholders consulted during the project preparation is provided in Annex 5 and the Stakeholder engagement plan is in Annex 6.

80. On state and entity level, ministries responsible for water management, water agencies, hydro meteorological institutes, climate change focal point in BiH (Ministry of Spatial Planning, Construction, and Ecology of Republika Srpska) and other environment related ministries, as well as civil protection were invited to participate in project preparation. On entity and cantonal level, political, operational and executive jurisdictions for water sector rest with line Ministries in charge of water. UNDP has excellent relationships with the both Entity Ministries in charge of water issues, developed through several water related projects implemented jointly in the past. The Ministries were extensively consulted in the Project Document preparation process and contributed data and practical guidance. One of the important roles of the Ministries in this project was to ensure that its activities are fully aligned with the relevant strategic and operational documents of the domestic government structures; as well as to ensure alignment of the project's activities with all the other ongoing projects and initiatives, the most important being the Emergency Flood Relief and Prevention Project (EIB Loan) for which the Entity Ministries are directly responsible as the PIU's for implementation of the EIB loan.

81. On local level, in the project preparation phase the project has mapped all stakeholders in the project area and created a reference group in each municipality. Civil protection organizations and representatives from municipal government actively participated in the project preparation. Additionally, civil society organisations that could be interested in project results would be involved and encouraged to take active participation. Particularly it would be environmental organisations, social inclusion and protection organizations (for returnees and displaced persons, vulnerable groups, minorities, etc.) who should be actively involved in project preparation and implementation. The project will make a specific attempt to involve private sector in the VRB. For example, micro agricultural businesses in VRB will be involved due to the fact that they are among most affected by floods groups.

2.2. Project rationale and policy conformity

82. According to the Initial National Communication (INC) of Bosnia and Herzegovina, the country needs international support for technology transfer. The INC emphasizes a need to modernize the hydro-meteorological network and create an integrated monitoring system, 'particularly with the purpose of automatic monitoring and software control of the situation in river basins'. The draft Second National Communication re-confirms importance of these activities. The Climate Change Adaptation and Low Emission Development goes a step further and identifies measures necessary to increase climate change resilience in the most vulnerable sectors including water management.

83. Bosnia and Herzegovina as an EU candidate country has an obligation to integrate water Acquis Communautaire. Both EU Floods Directive and EU Water Framework Directive are placing climate changes as one of the priorities to be integrated and considered in the planning phase. Additionally both International Commission for Protection of Danube River and International Sava River Basin Commission strategic documents foresee flood protection and adaptation to climate changes as a priority. However, as until now as there was no localized climate change model developed for BiH, there was no possibility to integrate climate changes in the water sector strategic documents in BiH. With the localized climate change model developed for BiH through SNC, now conditions exist to perform that task, but the country lacks knowledge, financial and human capacities to do that on its own.

84. The Government of Bosnia and Herzegovina has recognized a need to address flood risks and consequences, as well as associated impacts on populations and key socio-economic sectors in vulnerable areas in Vrbas River Basin. The Government of BiH (state level) is highly in favor of this project, which has been communicated with entity line ministries which also fully support the project. Although the existing water development framework does not consider the long-term implications of climate change, it provides favourable baseline conditions for the SCCF project to advance policies and implement a suit of on-the-ground measures for addressing adaptation needs in flood management.

Access to SCCF will enable BiH Government to address the above issue in Vrbas River basin and at the same time create a case of integrated approach to river basin management, which can be easily replicated to other river basins in the country, along with promotion of innovative adaptation strategies and technologies.

2.3. Design principles and strategic considerations

85. The Project is in line with the GEF CCA results framework: CCA-3: Adaptation Technology Transfer: Promote transfer and adoption of adaptation technology, where it will contribute to Outcome 3.1: Successful demonstration, deployment, and transfer of relevant adaptation technology in targeted areas and Outcome 3.2: Enhanced enabling environment to support adaptation-related technology transfer.

86. The project is:

- Country and target area-driven: consultation meetings have been organized with the flood-affected municipalities in the Vrbas River Basin. The proposed project builds on priorities identified through development of the National Communications, National Adaptation Strategy and preparation and implementation of UNDP Clean Vrbas project;
- Cost-effective: the project will take proven approaches to flood risk management replicable in other regions of the country;
- Supports implementation of national sustainable development and poverty-reduction strategies: the project will help to implement the priorities as outlined in the National Adaptation Strategy, as well as in the Poverty Reduction Strategy Paper—Mid-Term Development Strategy[18].
- Relevant: as outlined in the Problem description section, according to the National Communications, the problem of floods has been exacerbating in the last years and is expected become progressively more serious due to climate change in the country and in particular in the Vrbas River Basin.

2.3.1. Baseline Projects

Emergency Flood Relief and Prevention Project - EIB Loan

87. Following the 2009 floods the Government of Republika Srpska signed an agreement with European Investment Bank for Emergency Flood Relief and Prevention Project: Emergency reconstruction of flood protection facilities along Sava River and tributaries in 2011. The total value of this project is 92 million Euros to be implemented in 2012-2017.[19] The purpose of the project is to safeguard the agriculture, industrial and housing areas prone to flood impacts and to enable a stable basis for future development. The main focus of this project will be construction of hard engineering structures, mainly along the Sava River. The project will also make an inventory of damages to flood protection infrastructure within the RS's main Danube tributaries, prepare a Flood Risk Management and Flood Prevention plan including the identification of short, mid and long term measures and implement priority works for the remedy, repair and rehabilitation of damaged infrastructure in the most vulnerable areas. Aspects of spatial planning, redevelopment of flood areas and long and mid-term flood prevention measures are also included. In particular, the project will work on establishing protection zones and protected areas in accordance with the EU Directives. Out of the total project budget, more than USD 8 million are planned to be directly spent in the VRB area for activities which will include: construction and reconstruction of embankments on river banks, channels, pumping stations, project documentation, mapping of flooded areas, etc. Currently the project does not incorporate climate change considerations in its planned activities, including infrastructure designs. Based on a co-financing agreement with this project, climate risk management strategies policies and plans, to be developed using SCCF funding will

[18] Bosnia and Herzegovina: Poverty Reduction Strategy Paper—Mid-Term Development Strategy (April 2004, IMF Country Report No. 04/114 http://www.imf.org/external/pubs/ft/scr/2004/cr04114.pdf)

[19] According to the signed agreement, funds sould be spent until June 30th 2017 with possibility of extension upon agreement between EIB and the Government.

be taken into account when investing in infrastructure throughout BiH. In this way the EiB project will directly benefit from the activities under component 1 of this project.

Vrbas River Basin Environment and Tourism Development programme

88. In spring 2013, UNDP started a USD 1.25 million initiative - Vrbas River Basin Environment and Tourism Development programme, aiming to address key developmental challenges of the local communities through an integrated approach which will be focused on strengthening environmental protection, development of touristic potentials and local governance. The project's planned implementation timeframe is two years and it is implemented in partnership with Government of Japan, The Coca Cola Company, all the 13 municipal/city authorities of the VRB, CSOs and local communities in exactly the same VRB area as the proposed adaptation project. The Vrbas River Basin Environment and Tourism Development programme is a continuation of activities previously implemented in nine Municipalities of Vrbas basin through the "Clean Vrbas" project.

Disaster Risk Reduction Initiative in Bosnia and Herzegovina (DRR Project)

89. This project is being implemented by UNDP from early 2014 and shall end by end of 2015. Total project value is USD 500,000. The aim of the project is to improve the enabling environment to reduce risk of disasters, in particular by supporting efforts of DRR platforms at state as well as entity levels and development of relevant plans and studies, as well as awareness raising campaign. In order to increase preparedness and response capacities the project will enhance existing capacities to build a reliable and efficient response system using positive models like REACT in Tajikistan. The project will also work to improve capacity and knowledge of communities and municipalities in disaster prevention and preparedness, with particular attention to especially vulnerable social groups. It is envisaged that the project shall continue with a 2nd phase as of 2016.

Entity activities on flood protection (link with EU Flood Directive)

90. In 2010, Water agencies in BiH started activities on implementation of Directive 2007/60/EC on the assessment and management of flood risks. Based on 2007 IPA project "Support to Water Policy in BiH (Dec 2009 – Dec 2011)" a Sub-strategy for the implementation of the EU Directive was prepared in 2011.This Directive requires Member States (but also accession and pre-accession countries) to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. The Directive also reinforces the rights of the public to access this information and to have a say in the planning process. The main technical measures to be implemented by the Water agencies include preliminary flood risk assessment of the river basins and associated coastal zones and identification of areas where potential significant flood risk exists; development of flood hazard maps and flood risk maps for areas where real risks of flood damage exist; and flood risk management plans for these zones. Set deadlines are as follows:

	RS	FBIH
Preliminary flood risk assessment	2010-2013	2010-2013*
Flood hazard and risk maps	2015	2015
Flood risk management plans	2017	2017

*Completed in 2013. In 2014 WBIF (11th round) funds approved for preparation of Flood Risk Maps FBiH

2.3.2. Other relevant initiatives

West Balkans Drina River Basin Management Project

91. The objective of the World Bank Project is to assist the countries of Bosnia-Herzegovina, Serbia and Montenegro to achieve improved planning and implementation for integrated, cooperative management of the trans-boundary Drina River basin. The project proposal is to be prepared in 2014. Total project cost is US$ 7 million. Under Component 1: Multi-state Cooperation on International Drina Management, one of the planned activities is establishment and operation of a suitable, jointly endorsed hydrological simulation model combined with a climate change impact module. The model would notably support capacity for modelling various hydropower development, flood and drought, and land use scenarios. The hydraulic model would include reservoir operation optimization, environmental flow, and sediment transport control. The hydraulic model would provide knowledge about the present as well as future water uses, considering not only the nexus between hydropower generation and environmental protection but also the potential for flood mitigation measures along the Drina and its main tributaries. The model would require purchase of incremental equipment (automated flow /level gauges) for low- and high-flow conditions, flow rate – level rating curve determination, and calibration. The model would be a commercially available and updatable one-dimensional package, which would be compatible with similar models applied in the region and by the International Sava River Commission. The three countries and the International Sava River Commission would receive facilities and training to operate the model, protocols for standardization and for regular updating and maintenance will be agreed.

92. Under Component 2: Support for Flood and Drought Management and Community Participation would support the following: (i) Enhanced Flood Forecasting and Early Warning System at regional scale to complement the existing ones in the riparian countries; this would include (a) preparation of a Flood and Drought Preparedness Strategy; and (b) capacity building for implementation of flood and drought resilience measures. (ii) Small Grants and Awareness Program. Replicating the excellent experience in the GEF Neretva-Trebisnjica Management Project, the Project will set up a Small Grants Program to (co-) finance small, local initiatives by community organizations, schools, academics, private companies and other entities that have meritorious proposals to support the objective of the project.

93. As part of our project preparation a meeting with the World Bank was organized to discuss possible synergies and cooperation between the two projects. The main outcome of the meeting was agreement to align methodologies between the two projects.

Building Resilience to Disasters in the Western Balkans and Turkey Project

94. In May 2012, the UNISDR and WMO started the joint implementation of this project. It is supported by the European Commission DG Enlargement through the Instrument for Pre-Accession (IPA). The beneficiary countries are Albania, Bosnia and Herzegovina, Croatia, the former Yugoslav Republic of Macedonia, Montenegro, Serbia, Kosovo* and Turkey. The project overall objective is to reduce vulnerability of IPA beneficiary countries to disasters caused by the impact of natural hazards in line with the Hyogo Framework for Action (HFA) and increase their resilience to climate change. Specifically the project aims to:

- enhance the regional cooperation and capacity in addressing disaster risk reduction in the context of existing risks posed by typical natural hazards related to meteorological and hydrological hazards, as well as, new risks posed by a changing climate, with focus on building/enhancing regional networking and coordination in the area of disaster risk reduction,
- strengthen the cross-border cooperation in the area of disaster risk management, and
- enhance the regional capacity to supply/share/exchange data/information in the area of disaster risk reduction.

95. The Project is structured in 8 tasks: 4 of them are led by UNISDR and focus on DRR capacity building, DRR knowledge management, Disaster Risk Transfer capacities (insurance for disasters) and community based DRR. The other 4 tasks are led by WMO and focus on risk assessments,

meteorological forecast capacities, climate risk management and early warning systems. The project has a duration of 24 months and ended in May 2014. Total value of the project is 2.2 mill Euros. Final Steering Committee meeting will be held in Turkey in October 2014.

Improvement of Joint Actions in Flood Management in the Sava River Basin Project

96. The Sava Commission in the 11th round has received approval for the project “Improvement of Joint Actions in Flood Management in the Sava River Basin”. Opportunities for cooperation with this project will be sought.

Spatial information services for BiH - phase two Digital Orthophoto Maps Project (IPA National Programme 2008 Part II)

97. The project is primarily aiming to create conditions for a better functioning of the courts and of local land administration, but also to develop real-estate markets and enhance spatial planning capacities, etc. This project will provide a complete and functional way to overview the whole of Bosnia and Herzegovina, with a clearly visible and proportionally marked land structure, agricultural potential, forests, roads, cities, factories and other elements by creating ortophoto maps, aerial images and ortophoto maps. An overview of the whole of Bosnia and Herzegovina in this way would create a new possibility for Statistical agencies and enable them to prepare statistics in a much more reliable and accurate way. Also, it would be possible to create functional maps of agricultural areas and to make plans for future activities and develop functional development policies in agricultural sector.

98. Results of the project include aerial survey of the entire territory of Bosnia and Herzegovina and the preparation of digital orthophoto plans scale 1:5000 (for the whole territory of Bosnia and Herzegovina) and the scale of 1:2500 (for areas larger settlements - about 25% of the territory of Bosnia and Herzegovina). Within the project a digital terrain model was also prepared. Digital orthophoto plans and elevation model will be available by the end of June 2014, on the Geoportal Federal Administration for Geodetic and Property Affairs and will be utilized by the proposed SCCF funded project.

SEEC Catastrophe Risk Insurance Facility APL3

99. The World Bank, jointly with the UNISDR and the Swiss Secretariat for Economic Affairs (SECO), is planning to address the problem of low catastrophe and weather risk insurance penetration in South-eastern Europe through the creation of the regional Catastrophe Risk Insurance Facility (SEEC CRIF), which has been recently incorporated as "Europa Reinsurance Facility Ltd" (Europa Re)’. This World Bank project is still in preparation and it is not clear what the timeframes are for implementation. It will be important to establish linkages with this project when developing weather index insurance for Vrbas basin. The detailed socio-economic data that is being collected and the systematic approach and socio-economic vulnerability and risk model that is being develop in Output 2.2 of this project, could be linked to the World Bank project as a pilot.

Irrigation Development Project

100. The WB project objective is to improve the performance of the irrigation systems and institutions to support agricultural producers in the project area. The project will support better water resource planning and management for the sustainable use of water resources in irrigation and drainage and the mitigation of the impact of droughts and floods and in general help prepare more suitable adaptation strategies to also cope with climate change. The project budget is US$ 47 million between May 2012 and December 2017.

101. The project includes irrigation and drainage infrastructure investment (more than 80% of project costs) and irrigation modernization at agency and farm level (goods/equipment, consulting services, training). So far the project has works underway in 4 sub-project sites with 10 Million USD. The project also agreed with municipalities and Water User’s Association to modernize the water monitoring systems

and to train farmers on improved irrigation practices. In VRB, Laktasi is selected as one of "Five Priority Scheme Sites". Laktasi will benefit from establishment of new irrigation areas – 2.412 ha in Lijevče polje and 682 ha in Turjanica valley.

Projects within VRB- RS part (for issue of investment studies)

Projects ready for implementation:

1. Municipality Celinac (EUR 1,200,000.00): Erosion protection on Vrbanja river; Building of flood protection dam;
2. Municipality Srbac (EUR 704,000.00): Reparation and upgrade of two pumping stations (Bajinci and Inja);
3. Municipalities Prnjavor, Samac, Srbac (EUR 1,578,000.00): Flood Risk Maps for VRB.

Long term projects:

1. Banjaluka (EUR 1,000,000.00): Building of flood protection dam (1284m) and concrete parapet wall (195m) in Kumsale settlement;
2. Srbac and Laktasi (EUR 10,000,000.00): Building of revetments (10km);
3. Srbac (EUR 800,000.00): Watercourse regulation of Vrbas tributaries (1400m);
4. Laktasi (EUR 900,000.00): Watercourse regulation of Vrbas tributaries (1800m);
5. Banjaluka (EUR 11,500,000.00): Watercourse regulation of Vrbas (4500m);
6. Banjaluka (EUR 2,700,000.00): Watercourse regulation of Vrbas tributaries (Vrbanja 2400m, Dragocaj 1100m, Rijeka 600m, Crkvina 800m);
7. Kotor Varos (EUR 2,500,000.00): Watercourse regulation of Vrbanja (2500m);
8. Mrkonjic Grad (EUR 900,000.00): Watercourse regulation of several nameless water flows (1400m).

2.3.3. Project Benefits

102. The project is a direct response to the priorities that have emerged from the Second National Communication. The project is designed to respond to the flood risks to the most vulnerable communities in the Vrbas river basin, in the areas the most stricken by poverty and inhabited by many war returnees, displaced people and the rural poor that are among the most vulnerable social groups of the BiH. The project, by transferring best available technologies for climate resilient flood risk management, will directly benefit 250,000 people within two administrative parts of BiH and contribute to further reconciliation in a war damaged area. Indirectly the project will also benefit at least 464,000 people living in the VRB or 15% of the country's population.

103. The project will improve the knowledge base on flood risk through fully developed modelling and flood mapping. This, as well as the efforts to increase institutional capacity, will lead to improved strategic management of flood risk and improved flood forecasting and warning. In particular, the population of the VRB will benefit from improved lead warning times to flood events due to implementation of the forecasting and improvement of the early warning systems. Implementation of spatial planning on the basis of flood zones will lead to reduced exposure of the target population in the VRB. Overall vulnerability of the population in VRB to flooding will be reduced due to increased awareness and direct engagement of local communities in flood risk management. Adaptation of climate resilient agricultural practices by farmer communities will increase their adaptive capacity and reduce exposure. Targeted training in FRM functions will further increase adaptive capacities within municipalities.

2.3.4. Comparative Advantage of UNDP

104. In Europe and CIS region, UNDP is one of the leaders in supporting countries on advancing climate change adaptation and in assisting governments in preparation of low-carbon and climate-resilient development strategies. In Bosnia and Herzegovina, UNDP is the leading government partner on all

climate change related issues. With the technical assistance of UNDP, the Government has prepared, adopted and submitted the INC and SNC to the UNFCCC and is currently finalizing FBUR. UNDP has also supported the Government in preparing Climate Change Adaptation and Low Emission Development Strategy.

105. UNDP Country Office (CO) has a strong presence in the field, and one of the four regional offices is based in the Vrbas River Basin. This office is responsible to coordinate all UNDP activities in VRB and to implement Clean Vrbas Project. Furthermore, UNDP established partnerships and trust with governments, civil society and private sector and developed cross-sectoral expertise in strengthening economic development, social development, and governance. All the above, together with a proven record of designing and implementing climate change policies and measures, gives UNDP CO in Bosnia and Herzegovina a comparative advantage for implementing SCCF funds.

106. UNDP Country Office successfully implemented various water management related projects and activities (policy development, capacity building, infrastructure) in Bosnia and Herzegovina. UNDP has strong partnership, a very well developed network and access to BiH's key institutional stakeholders, specifically in the water and climate change sectors, which will contribute to a successful project execution and further replication throughout BiH.

107. In order to ensure effective project implementation, UNDP will work at the upstream policy level and implement downstream initiatives, the greatest value added being that UNDP is one of the few actors in the country that can strengthen connectivity between the two – turning projects into policies and policies into actions. Using its competitive advantage – political neutrality and impartiality – UNDP will facilitate intergovernmental cooperation and will upscale its hallmark experiences in the area of policy advise and local development. Critical to success is tailored but replicable development solutions to governments at all levels, while expanding cooperation with civil society and the private sector.

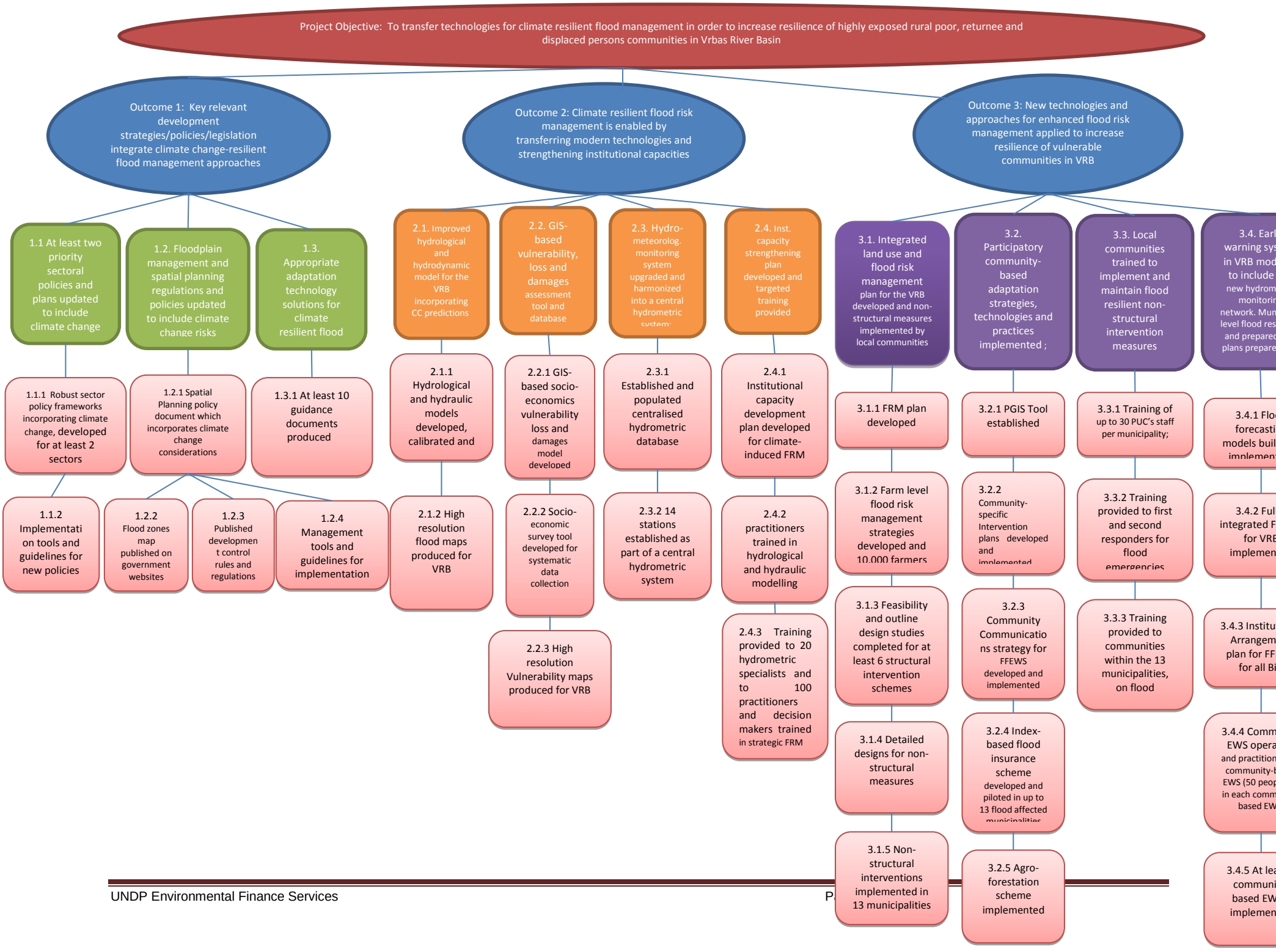
108. Within its work related to sustainable management of environmental and energy resources, UNDP directly contributes to the achievement of the UNDP Strategic Plan resilience and sustainable development agenda. Specifically, the project will support achievement of the country programme outcome 5: "By 2019, legal and strategic frameworks are enhanced and operationalized to ensure sustainable management of natural, cultural and energy resources", while at the same time will contribute to programme outcome 3: "By 2019, there is effective management of war remnants and strengthened prevention and responsiveness for man-made and natural disasters", particularly with regard to design and institutionalisation of legal and policy frameworks supporting effective disaster and climate risk management.

2.4. Project Objective, Outcomes and Outputs/activities

Project Objective: To transfer technologies for climate resilient flood management in order to increase resilience of highly exposed rural poor, returnee and displaced persons communities in Vrbas River Basin		
Project Component	**Expected Outcomes**	**Expected Outputs**
1. Enabling environment for climate risk sensitive water and flood management	1. Key relevant development strategies/policies/legislation integrate climate change-resilient flood management approaches	1.1 At least two priority sectoral policies and plans (e.g. agriculture, hydropower, water resources) updated to include climate change modeling results; 1.2. Floodplain management and spatial planning regulations and policies updated to include climate change risks (revision of land use regulations, stricter policy on construction permits in the areas prone to flooding, etc); 1.3. Appropriate adaptation technology solutions for climate resilient flood management in BiH codified and disseminated.
2. Technical and institutional capacity for transferring climate resilient flood management technologies and approaches	2. Climate resilient flood risk management is enabled by transferring modern technologies and strengthening institutional capacities	2.1. Improved hydrological and hydrodynamic model for the VRB incorporating climate change predictions, developed to produce flood hazard inundation maps for spatial planning and emergency response planning, and for the long-term strategic flood risk management of the VRB; 2.2. GIS-based vulnerability, loss and damages assessment tool and database established and institutionalized to record, analyze, predict and assess hydro-meteorological and other hazard events and associated losses; 2.3. Hydro-meteorological monitoring system in the VRB upgraded (increased from 11 to 25 gauging stations) and harmonized into a central hydrometric system; 2.4. Institutional capacity strengthening plan developed and targeted training on climate-induced flood risk management provided to at least 100 practitioners and decision-makers;
3. Climate resilient flood management technologies for vulnerable communities in VRB	3. New technologies and approaches for enhanced flood risk management applied to increase resilience of vulnerable communities in VRB	3.1. Integrated land use and flood risk management plan for the VRB developed and non-structural measures implemented by local communities (through Output 3.2.), government and/or private sector; 3.2. Participatory community-based adaptation strategies, technologies and practices implemented in priority flood risk areas (e.g. community afforestation scheme on the flood plains; establishing locally controlled and managed flood zones; watershed rehabilitation works, etc); 3.3. Local communities (particularly women and refugees) trained to implement and maintain flood resilient non-structural intervention measures, including agricultural practices such as agro-forestry, to improve livelihoods of 13communities in the VRB, and community-based flood early warning systems; 3.4. Early warning system in VRB modified to include the new hydrometric monitoring network as part of a fully-integrated flood forecasting system (comprised of centrally-based and community-based early warning systems). Municipal-level flood response and preparedness plans prepared and implemented.

2.4.1. Theory of Change

109. The theory of change for the project has been assessed and is articulated in Annex 10. For each project output, the main barriers and risks were identified as it relates to Affected Communities/Public, Policy makers/Government Regulatory Agencies, Private Enterprises/Commercial stakeholders and Supply Chain. The level or severity of the risks for each type of receptor was graded from severe (red) to low (green) and an overall risk category determined. The last column presents the project activities that will be undertaken to mitigate the risks, overcome the barriers, and achieve the project outputs. The Figure below is a diagrammatical representation of the main components of the Theory of Change table.


Project Objective: To transfer technologies for climate resilient flood management in order to increase resilience of highly exposed rural poor, returnee and displaced persons communities in Vrbas River Basin
Outcome 1: Key relevant development strategies/policies/legislation integrate climate change-resilient flood management approaches
Outcome 2: Climate resilient flood risk management is enabled by transferring modern technologies and strengthening institutional capacities
Outcome 3: New technologies and approaches for enhanced flood risk management applied to increase resilience of vulnerable communities in VRB
1.1 At least two priority sectoral policies and plans updated to include climate change
1.2. Floodplain management and spatial planning regulations and policies updated to include climate change risks
1.3. Appropriate adaptation technology solutions for climate resilient flood
1.1.1 Robust sector policy frameworks incorporating climate change, developed for at least 2 sectors
1.2.1 Spatial Planning policy document which incorporates climate change considerations
1.3.1 At least 10 guidance documents produced
1.1.2 Implementation tools and guidelines for new policies
1.2.2 Flood zones map published on government websites
1.2.3 Published development control rules and regulations
1.2.4 Management tools and guidelines for implementation
2.1. Improved hydrological and hydrodynamic model for the VRB incorporating CC predictions
2.2. GIS-based vulnerability, loss and damages assessment tool and database
2.3. Hydro-meteorolog. monitoring system upgraded and harmonized into a central hydrometric system
2.4. Inst. capacity strengthening plan developed and targeted training provided
2.1.1 Hydrological and hydraulic models developed, calibrated and
2.2.1 GIS-based socio-economics vulnerability loss and damages model developed
2.3.1 Established and populated centralised hydrometric database
2.4.1 Institutional capacity development plan developed for climate-induced FRM
2.1.2 High resolution flood maps produced for VRB
2.2.2 Socio-economic survey tool developed for systematic data collection
2.3.2 14 stations established as part of a central hydrometric system
2.4.2 practitioners trained in hydrological and hydraulic modelling
2.2.3 High resolution Vulnerability maps produced for VRB
2.4.3 Training provided to 20 hydrometric specialists and to 100 practitioners and decision makers trained in strategic FRM
3.1. Integrated land use and flood risk management plan for the VRB developed and non-structural measures implemented by local communities
3.2. Participatory community-based adaptation strategies, technologies and practices implemented ;
3.3. Local communities trained to implement and maintain flood resilient non-structural intervention measures
3.4. Early warning syste in VRB modif to include th new hydromet monitoring network. Munici level flood respo and preparedn plans prepared
3.1.1 FRM plan developed
3.2.1 PGIS Tool established
3.3.1 Training of up to 30 PUC's staff per municipality;
3.4.1 Flood forecasting models built a implemente
3.1.2 Farm level flood risk management strategies developed and 10,000 farmers
3.2.2 Community-specific Intervention plans developed and implemented
3.3.2 Training provided to first and second responders for flood emergencies
3.4.2 Fully integrated FFE for VRB implemente
3.1.3 Feasibility and outline design studies completed for at least 6 structural intervention schemes
3.2.3 Community Communicatio ns strategy for FFEWS developed and implemented
3.3.3 Training provided to communities within the 13 municipalities, on flood
3.4.3 Institutio Arrangemer plan for FFEV for all BiH
3.1.4 Detailed designs for non-structural measures
3.2.4 Index-based flood insurance scheme developed and piloted in up to 13 flood affected municipalities
3.4.4 Commu EWS operato and practitioner community-ba EWS (50 people in each commu based EWS)
3.1.5 Non-structural interventions implemented in 13 municipalities
3.2.5 Agro-forestation scheme implemented
3.4.5 At leas community based EWS implemente

2.4.2. Outcomes, outputs and activities

OUTCOME 1: Key relevant development strategies/policies/legislation integrate climate change-resilient flood management approaches

Co-financing amounts for Outcome 1: $1,500,000

SCCF project grant requested: $655,000

Without SCCF Intervention (baseline):

110. Flood risk management in BiH is currently aimed at emergency response to flood events rather than strategic management of flood risk through the legislative and policy framework and appropriate sectoral policies and plans that incorporate climate change considerations.

111. As mentioned above, key entity strategic documents, such as Action plan for sustainable management of flood risks for Planning period 2010 - 2021 in Republic of Srpska or Water Management Strategy for Federation of BiH up to 2021, do not enable a strategic approach to flood risk management on the river basin scale or consider climate change risks. Sub-strategy for the implementation of EU Directive on assessment and management of flood risks contains provisions for shifting towards sustainable flood risk management. However, it contains only a few sporadic references to climate change issues. Moreover, its implementation is delayed and depends on funding availability.

112. **UNDP DRR** Project will work to develop a state level coordination mechanism between various institutions and authorities (Civil Protection, Ministry of Security on state level, etc.) in the area of civil protection. It will also provide a policy foundation for disaster risk reduction at state and entity level. The DRR project will not focus specifically on floods and other hazards, but rather will set general mechanisms and coordination lines in BiH. The project will also support integration of Disaster Risk Reduction into development programmes ranging from the local communities to the state level. Through supporting the National Disaster Risk Reduction Platform, established in 2013, the DRR project will facilitate a shift in focus from disaster response, upon which present capacities are predicated, to disaster prevention through policy actions and the development of a priority sector plan, which will serve as an example and provide evidence for further advocacy and action in this direction. Lessons learned about how to make disaster risk reduction an integral part of development will be promoted throughout the project implementation. The DRR project will also invest in preparedness and response system that will lead to a decrease in disaster losses.

113. **The Sub-strategy** for the implementation of the EU Flood Directive mentions development and implementation of a Formal guidance on Flood Risk Management and Spatial Planning, which should be based on international best practice in spatial planning taking into account flood risk. However, references to climate change are very limited in this document and it is not clear whether this Formal guidance will incorporate climate change considerations. Furthermore, implementation of the Sub-strategy is highly dependent on funding availability.

114. A result of the fragmented nature of the legislative and institutional framework described in the situation analysis, is that key sector policies are failing to adequately include flood risk and climate change considerations in their formulation and as a result, their current formulations perpetuate or exacerbate the risk of climate induced flooding and its consequences, now and in the future. This section discusses four key sectors and identifies their limitations in this regard, as well as key potential entry points for embedding flood risk management and climate change considerations into sector policies, strategies and plans. The sectors discussed are spatial planning, agriculture, energy, and forestry.

With SCCF Intervention (adaptation alternative):

115. The project will build on the existing legislative and regulatory framework and will fully mainstream the climate risk management (CRM) aspects, especially in relation to flood hazards. It will also complement the **DRR project** mainstreaming CRM in development programmes at the local, entity and state level. More specifically, the project will update at least two sectoral policies and plans (in

addition to spatial planning which is dealt with separately) to embed flood risk and climate change considerations. The project will aim to include as many relevant sectors as possible, but given the discussions above, the two main sectors for consideration would be energy (as it relates to HPP dams) and agriculture. It should be noted that forestry will still be considered, as it relates to spatial planning. With respect to the energy sector, the project will develop policies for the safety and maintenance of dams in the VRB basin and will examine the potential role of the existing and planned dams in flood alleviation. The policy will examine and strengthen dam safety guidelines for BiH in line with international best practice. This will include development of guidelines for the categorisation of dams into different risk categories, the establishment of spillway discharge capacities that will need to be provided for dams of different risk categories (with CC considerations), the establishment of dam safety inspection intervals, guidelines on the assessment and quantification of risks associated with dams, including risk of overtopping, exposure to landslides and increased sedimentation, and the development of appropriate risk management plans for individual dams. Stemming from the long term requirements under climate change, the project will assess the current and long-term ability to operate dams in a flood alleviation role during large flood events, to ensure that sufficient flood storage is provided at the start of large events, to ensure dam safety and to provide some attenuation of the flood wave. This will require the involvement of dam owners and operators in the development and eventual implementation of the overall flood management plan for VRB, and the development of individual operating rules for each dam during floods, which meets the dam safety requirements for the dam, and which also fits into the VRB basin flood management plan, particularly during large flood events. This will therefore involve optimisation of the dam operations for the dual uses of power generation and flood alleviation. At the very least, the policy should ensure that dams are maintained and operated in a manner which avoids exacerbation of the flood risk, and which takes account of the increasing risks they pose due to climate change.

116. With respect to the agricultural sector the project will, ensure that CC is taken into account in upgrading of agricultural infrastructure systems. Agricultural master planning will be introduced from the standpoint of flood protection and will include the consideration of risks and opportunities for flood management in the design and development of agricultural infrastructure. The project will also embed flood risk under CC considerations into the reconstruction and upgrade of existing hydro amelioration systems. In addition, the project will look to introduce approaches such as agro-forestry measures which could provide flood management benefits and opportunities while enhancing the flood resilience of the agricultural sector.

117. With respect to spatial planning and development control, the project will take a basin-wide view of flood risk in order to understand and respond to the critical processes that lead to flooding within the basin, through the use of flood modelling and mapping (produced under Outcome 2) which will take account of future flood risk under climate change. This will underpin the floodplain development policy that the government will formulate to achieve a basin-wide resilience to increasing flood risks resultant from climate change. More specifically, the project will help formulate a comprehensive floodplain development policy, based on peculiarities of the Vrbas river basin. Development on land in flood plains has historically taken place in many areas mainly due to a natural tendency for settlers to utilize land that is near bodies of water, not with consideration of emerging risks. The current regulatory weaknesses described above and absence of any floodplain zoning policies also contributes to this progressively increasing exposure and vulnerability. As a result, the potential for flooding is often recognized only after the occurrence of climate hazard. Floodplain management and spatial planning are known as an effective means of flood prevention in the face of long term anticipated impacts of climate change. The project will develop a flood zone designation policy on the basis of flood mapping and outline the permitted land uses in each zone. It will also establish and publish development control rules and regulations designed to zone activities away from high risk areas and to encourage environmental enhancement of the floodplain. It will develop and implement a capacity building roadmap for state and entity authorities to integrate the new land use regulations into development planning at all levels. This will include the development of management tools that will be needed for implementing and enforcing the new land use regulations (such as compulsory flood risk assessments for individual property developments in the riskier zones within the floodplain, as part of the decision making process for granting planning permission). The introduction of floodplain zoning based on flood risk mapping represents a transfer of well-established floodplain management practices from countries that have been using this method for decades such as the UK,

USA and Australia. The project will look to these areas for best practice approaches that can be adapted to the BiH context.

118. The project will collect lessons learned from all activities and facilitate dissemination of successful approaches in the country. In particular, the project aims to transfer best available approaches in climate resilient flood risk management from around the world and adapt them for the Vrbas River Basin. After implementation in the Vrbas River Basin, the successful practices will be codified in a form of guidance documents and upscaling in the rest of the country will be promoted. Most countries that are advanced in flood risk management have country wide accepted guidance documents and tools on how to undertake flood risk management for any part of their territories and this project will aim to establish such guidance and tools for BiH.

119. For example, the approach to developing floodplain management and spatial planning policy to manage flood risk for the Vrbas basin will be scalable to other basins within BiH and this will be made possible by ensuring that the policy developed, while addressing the peculiarities of the Vrbas basin, is cognizant of the overall country picture and is therefore sufficiently general to be applied elsewhere. The new policy will therefore take an inter-government (state and entity) perspective and will ensure that all key players are consulted in its development. Ideally the policy changes will be matched by legislative change if possible.

120. To ensure upscaling, all tools, procedures, etc. developed by the project will contain recommendations on how to develop a similar approach for other regions in BiH. Particular attention will be paid to collecting best practices and lessons learned on how to make climate resilient flood risk management an integral part of development process, which will be done by building on mainstreaming approaches and using dissemination mechanisms established by the DRR project.

121. A key benefit of this output is the establishment of a holistic, proactive approach to flood risk management which incorporates climate change considerations. Importantly, effecting change at the regulatory and policy level will ensure country wide implementation to other river basins. The development of the new regulatory framework should be cognizant of the wider implications and bring to bear, the full country requirements within the framework.

Output 1.1. At least two priority sectoral policies and plans (agriculture and hydropower) updated to include climate change modeling results

Output 1.1 deliverables

1) Robust sector policy frameworks incorporating climate change developed for at least 2 sectors

2) Implementation tools and guidelines elaborated for new policies

Indicative Activities

1) Update and extend the review of legislation, policies strategies and plans that was undertaken during project development, to confirm all sectors of relevance to flood risk (where activities impact or are impacted by flooding) and review in detail their governing policies, strategies and plans that impact on flood management. Identify entry points in the policies and plans for introducing Climate Change considerations within the energy (related to HPP dams) and agriculture sectors.

2) Establish an inter-agency working group to help outline and examine the current policy framework relating to water and flood risk management in BiH and which could best elaborate current practice and deficiencies with respect to FRM and the inclusion of climate change considerations. Given the fragmented nature of the current elements of water resources management in BiH, the establishment of a working group, which will be comprised of representatives from all relevant agencies and organisations across entities, is an essential first step to ensure inclusion and consultation from the beginning and throughout the process. This will enable an active participatory approach (experts from relevant line-ministries and water agencies) on development of sectoral policies and will ensure buy-in to the final policy changes.

3) Undertake detailed technical studies (including modelling) on CC impacts on the identified sectors (energy and agriculture) in the VRB. Consult with sector leaders on findings of study and invite comments on recommendations. This can be done using the established inter-agency working group as well as stakeholders who will be impacted by the changes.

4) Develop and codify detailed methodologies for incorporating CC modelling results into risk assessments, strategies, policies and plans for the energy and agriculture sectors.

5) Develop and finalise robust sector policies frameworks and guidelines to incorporate climate change including any necessary enabling guidelines and/or tools for effective implementation of new policies.

Output 1.2. Floodplain management and spatial planning regulations and policies updated to include climate change risks (revision of land use regulations, stricter policy on construction permits in the areas prone to flooding, etc)

Output 1.2 deliverables

1) Spatial Planning policy document which incorporates climate change considerations

2) Flood zones map published on government websites (internal and external as appropriate) with flood zones designations policy document outlining permitted land uses in each flood zone

3) Published development control rules and regulations

4) Management tools and guidelines for government implementation and enforcement of new flood zoning policy

Indicative Activities

1) Undertake detailed review of existing spatial planning legislation and policies and policies for zoning development and economic activities.

2) Using the detailed flood hazard mapping derived in Output 2.1, develop a flood zone designation policy, and outline the permitted land uses in each zone. Consult with all stakeholders on the designated flood zones.

3) Develop policies that will protect against the impacts of flood risk. This will include incorporating climate change flood resilience into construction and building codes for properties in the floodplain. To this end, existing building codes will be reviewed and compared against international best practice, from which the most appropriate flood resilience measures will be incorporated into existing construction and building codes.

4) Establish and publish development zoning control rules and regulations.

5) Develop and implement a capacity building roadmap for state and entity authorities to integrate new policies, plans and strategies into spatial planning, including management tools that will be needed for implementation and enforcement for new policies.

6) Undertake an impact assessment of the proposed new legislation and policy to determine and quantify effects on distribution of population and demographics within the floodplain, projected distribution of economic activity, and benefits to protection from climatic extremes, benefits of environmental protection and benefits and economic growth that will result from improved water supply.

Output 1.3. Appropriate adaptation technology solutions for climate resilient flood management in BiH codified and disseminated

Output 1.3 deliverables

1) At least 10 guidance documents on topics listed below.

Indicative Activities

1) produce an article and footage every year to showcase what has been done and what has been learned annually

2) Produce technical and non-technical guidance documents for all studies and assessments undertaken as part of the project. These documents will be developed to guide future similar assessments and will be updatable on at least a 3-yearly basis to keep pace with advances in methods and technology. This component will therefore produce the following documents:

a. Assessment of climate change impacts on different sectors, at the basin scale and incorporation of CC impacts into sector policies

b. Flood risk modelling and mapping guidance document

c. Hydrometric Network rehabilitation

d. Guidance for the design, implementation and maintenance of hydrometric stations

e. Guidance for the development of a centralised flood forecasting and early warning system

f. Guidance for the development of a community-based early warning system

g. Guidance for undertaking field surveys for river topographic surveys, river flow surveys, and landslide surveys

h. Guidance on socio-economic vulnerability loss and damages assessments

i. Guidance on the feasibility studies and design methods for non-structural FRM interventions (depending on which ones are implemented as part of this project)

j. Guidance on public participatory risk assessment

k. Guidance on incorporating gender issues in risk management.

OUTCOME 2: Climate resilient flood risk management enabled by transferring modern technologies and strengthening institutional capacities

Co-financing amounts for Outcome 2: $1,600,000

SCCF project grant requested: $1,315,000

Without SCCF Intervention (baseline):

122. In BiH the traditional approach for addressing flooding has been to build flood defences, and this is where current experience and capabilities lie within water and flood management institutions. Experience of integrated Flood Risk Management approaches is limited and is a relatively new, and thus requires additional capacity building and financial resources, to enable the effective application of such approaches for adaptive flood risk management among the agencies responsible for water management. Expertise in flood risk assessment using tools such as hydrological models is limited particularly within

government organizations. Private companies have some expertise but even they are limited with regard to integrating climate change considerations into flood risk models.

123. Another important aspect of managing flood risk and developing adaptive capacities, is the ability to assess vulnerability and hence to test the effectiveness of adaptation measures in reducing vulnerability. The information required to assess vulnerability is not currently available and is not collected systematically, nor are there up-to-date methodologies for collection of information and assessment of damages. There are established procedures for assessment of damages within BiH, which are executed by municipal civil society protection departments, but quality varies from municipality to municipality. Annex 9 is a table of the main socio-economic datasets normally required for undertaking flood risk and vulnerability assessments (and which will be required of any vulnerability model as input data), and lists the issues encountered with trying to obtain these datasets during project preparation. The project will look to establish data collection methods to address this during the project and in the long-term. The establishment of methods for collecting such data will have much wider benefits to BiH in many other sectors.

124. Key to the strategic management of climate-induced flood risk is to have appropriate density and frequency of monitoring of important hydrometeorological variables. The existing hydrometric network of the VRB (and BiH in general) is currently owned and operated by disparate agencies/institutions (for example public electricity institutes in charge of HPP stations) and data collected is not centrally stored, although it is made available to hydro-meteorological institutes (See **Figure 5**). In addition, not all data is available in electronic format. Given the importance of accurate historical hydrometeorological records in the assessment of flood risk, it would be important to ensure that the hydrometric network is spatially optimised and centrally managed, and that data is made available to all flood management practitioners.

125. The Vrbas basin is characterised by large spatial and temporal variability in rainfall and flow and it is therefore necessary to have sufficient spatial coverage (number and distribution of rain and flow gauges) to provide accurate flood forecasts and long lead-times to respond to flooding. Up to 1991 there were 36 separate gauges installed on the Vrbas River (10) and its tributaries (26), however during the war many were destroyed and only 11 of these gauges were operational in 2011. Those 11 are mainly located along the main watercourse. Principally due to costs, very few of these gauges are in working order and many need to be re-surveyed because of large floods altering the stream profile. In recent years some have been renewed, maintained and monitored, but the majority still need attention. This is particularly important for tributaries which are now without gauging stations and there is no possibility for EWS during floods (see map below).

Figure 5: Existing Hydrometric network on the VRB

	Measuring profile	Distance from mouth (km)	Catchment size (km^2)	Equipment
Vrbas	Gornji Vakuf	208.00	205.00	Automated monitoring station
Vrbas	Donji Vakuf		1034	Automated monitoring station
Vrbas	Han Skela			Limnigraph
Vrbas	Kozluk-Jajce	149.00	3161.00	Automated monitoring station
Vrbas	Bočac (downstream)			Limnigraph
Vrbas	Banja Luka-city bridge			Mechanical limnigraph
Vrbas	Delibašino selo		5218.18	Water level meas. lath, gas limnigraph
Vrbas	Razboj	12.00		Water level meas. lath
Pliva	Volari			Automated monitoring station
Crna rijeka	Mrkonjić Grad			Water level meas. lath
Crna rijeka	Crna rijeka			Water level meas. lath
Vrbanja	Vrbanja mouth		791.28	Mechanical limnigraph

126. The **Sub-strategy for implementation of EU Flood Directive** notes that one of the main institutional risks for successful implementation of flood risk management is the lack of qualified human resources for data collection and data management, modelling and risk assessment. Furthermore, there is a lack of capacity of local government to contribute data and information, and to be properly engaged in the flood risk assessment and management. Finally, there is a serious understaffing in professional institutions for water management as discussed in Section 1.3.3.

127. In the list of priority measures to be implemented by **the Emergency Flood Relief and Prevention Project,** only three out of 13 municipalities from the VRB were included. Activities prioritized are flood mapping in municipalities of Srbac, Celinac and Laktasi and infrastructure maintenance in Srbac (canal cleaning and pumping station upgrade).

128. To date the **Water agencies** have spent approximately USD 800,000 in the last three years on activities aimed to implement EU Flood Directive. Some of these funds were spent in VRB to produce PFRA maps, hazard and risk maps have not yet been produced for VRB. The Water agencies (in line with **the Sub-strategy**) initiated Preliminary Flood Risk Assessment (PFRA) for watercourses in FBIH, which included (i) collection of historic data with a comprehensive search of local sources (municipal representatives in charge for civil protection); (ii) assessment of extent of flood events based on existing hydrologic extremes (only rough estimate); (iii) development of indicative flood maps based on topographic maps and data from various projects. After PFRA, hydrodynamic modelling of flood areas was done for river stretches were Digital Elevation Model and cross section data were available, but not for Vrbas. Flood hazard and risk maps were prepared for five flood areas out of total 82 identified in FBiH. As data for Vrbas was not available, none of those five maps are in Vrbas catchment. The main constraint for Water agencies to continue with production of hazard and risk maps, is the lack of digital elevation model and channel sections and structures survey. Activities also included supply and installation of 23 automatic monitoring stations (river Bosna) and development of hydrodynamic models for the Sava river basin with the aim to produce flood risk maps in the future. Flood hazard and risk maps should also be prepared for the VRB as part of the Water Agencies EUFD implementation activities however, at this stage it is not clear when this will be done due to the lack of financing.

With SCCF Intervention (adaptation alternative):

129. This component will be focused on developing the tools, data, databases, monitoring systems, methods and procedures for enabling effective flood risk management. It will also include the elaboration of an institutional capacity development plan, and the provision of training in the use of all tools developed. The selection of measures for enabling effective flood risk management, as well as institutional capacity development plan will be based on the Needs Assessment performed by **the DRR Project**, upon which this project can build, an institutional capacity plan specifically for flood risk management. The Institutional development plan will also be closely coordinated with the Communication and engagement plan to be developed under **Sub-strategy for implementation of EU Flood Directive**.

130. There is currently no definitive or accurate hazard mapping for the Vrbas basin. The SCCF funding will enable extending mapping to be implemented by **the Emergency Flood Relief and Prevention Project** to the other 10 municipalities in the VRB and making sure that climate change risks are properly incorporated into the process. The proposed project will also attempt to fill in data gaps which prevented the Water agencies from producing hazard and risk maps for the VRB. In particular, it will acquire the DEM data, undertake river cross-section surveys, and develop hydrological and hydrodynamic models for flood hazard assessment and mapping. As discussed under the **"Spatial information services for BiH - phase two Digital Orthophoto Maps" project,** a DEM will be made available which provides a resolution of 5m x 5m. This will be an appropriate resolution for flood hazard modelling and mapping and it is expected that the DEM will be provided for free to the project.

131. In the first instance, modelling tools and methods of hazard and inundation modelling under conditions of climate change will be introduced to government departments involved in flood risk management, and flood hazard models and maps will be developed for the entire Vrbas project area. During project inception, a review of hydrological and hydraulic modelling software will be undertaken and the most appropriate tools selected, based on a user requirements gathering exercise with end users of the model (the practitioners). The key considerations in selecting the model will be technical robustness for modelling the specific peculiarities of the VRB flooding, data availability now and in the future (ensure updatability when more data becomes available in the future), sustainability, cost and maintenance of the models and likely opportunities for continued development of skills in modelling

132. Based on the hazard and inundation maps, SCCF resources will be used to enable flood buffers to be established by Government with appropriate zoning categories such as: a climate change flood zone; a designated floodway fringe; a flood plain; a designated floodway; and lastly, the body of water itself (related to Output 1.2). In addition, the hazard maps could be used by state, entity, cantonal and local authorities, and communities in the development of emergency preparedness and response plans, for raising public awareness and improving community preparedness. The visual maps will benefit decision makers and all involved in natural hazard risk management at all levels. It will also enable government and donor agencies to better focus their efforts in dealing with hazards in the basin in the future. A key benefit of this component is that the model will be a tool that can be used by the appropriate government agencies for the long-term strategic management of flood risk in the basin (see Outcome 1). The hazard maps will provide the basis for the management of climate-induced hydrometeorological hazards in the Vrbas basin now and in the future. The introduction of flood modelling methods, tools and practices is a key technology transfer opportunity for BiH, which is likely to have long-term benefits to climate-induced flood risk management and development of adaptation approaches.

133. With support of 'Coordination of Mayors of Vrbas Municipalities for protection of the river', established with support of the **Clean Vrbas project**, the project will undertake socio-economic surveys to map existing vulnerability within the catchment and will undertake economic assessment to identify the most appropriate adaptation options to reduce vulnerability. The project will establish approaches to collect necessary socio-economic datasets for VRB and BiH in general and will establish a socio-economic model for BiH.

134. Importantly, the project will fully map the socio-economic conditions of the rural poor, returnees and displaced person within the catchment, which will contribute to a body of data that is currently missing from BiH. In undertaking this mapping exercise, the community will be engaged and encouraged to participate in the development of climate resilient adaptive measures that will meet their needs (to be implemented in Outcome 3). In order to develop flood vulnerability maps, a GIS-based tool will be

developed to integrate various spatial socio-economic data with the flood hazard maps, and to produce vulnerability maps which will include damages and loss of life estimates. During project preparation, a number of different proprietary socio-economic models were reviewed including: CAPRA, Kalypso, Hec-Ras/Hec-HMS/Hec-FDA/Hec-FIA (the Hec Suite), Sobeq with HIS-SSM, Risk Scape, Hazus-MH, Ina-Safe. Many of these models provide the facility to calculate the losses, damages or vulnerability of each flood from flood hazard maps. The review concluded that there is a need to determine what socio-economic datasets are likely to be available as standard, for input to the loss and damages model, before a model is selected.

135. The project will develop tools, methods, guidelines and procedures for recording flood events, undertaking post-event surveys and assessing vulnerability to flooding as well as assessing the effectiveness of flood mitigation measures in reducing vulnerability and damages for long-term future management of flood risk. This is also an example of technology transfer with long-term benefits to BiH.

136. The project will establish a spatially enabled data repository which will serve to store, maintain and manage all information pertaining to flood risk and to link spatial and temporal datasets such as river flows, rainfall etc. The data repository will provide a structured environment to enforce data integrity and support data auditing, versioning and data quality, and to facilitate sharing of important hydrometeorological datasets. Audit trails, as well as structured and categorised schemas, will make data collation, manipulation and analysis more manageable. River basin management is inevitably a multidisciplinary and an inter-departmental undertaking, and such a structured GIS data repository is envisaged to provide the framework within which to approach flood risk management in a multi-disciplinary manner and to enable data sharing among relevant stakeholders.

137. In order to establish a much better hydrometric monitoring network for the Basin in future, the project will undertake an assessment of the monitoring network requirements for effective monitoring for strategic flood risk management, flood forecasting and early warning. Local hydrometry experts have already identified a number of gauges that are in need of repair, rerating, and refurbishment, as well as new gauging stations. The project will provide technical and financial assistance in order to improve hydrometric monitoring network. The upgrade and extension of the hydrometric network represents a key technology transfer opportunity which will enhance BiH's ability to undertake strategic monitoring, forecasting and early warning in the VRB.

138. Flood modelling and risk mapping, flood forecasting and development of early warning systems, rely on the use of long historical records of the key hydrometeorological variables that characterise a river basin. Long-term historical observations for now defunct gauging stations exist in various formats for the study basin (including paper) which need to be digitised for use in hydrological and risk analyses to support the flood risk mapping, forecasting and early warning system. An initial task will be to examine all of the data to be digitised and identify the most efficient procedures for digitising, including consideration of technologies such as Optical Character Recognition software that will enable data on scanned pages to be digitised. The project will also establish a quality control and assurance system set up to ensure data quality.

139. The long-term implementation and continued practice of climate resilient risk management will necessitate training at the all levels. State and entity staff with responsibility for flood management and protection will be targeted for training in advanced climate risk management planning and flood risk management measures. Indeed, the Second National Communication for BiH Chapter 5.3.3 lists a number of objectives that will need to be fulfilled in education, training and awareness-raising on climate change. Among other things, the SNC suggests adoption of a strategy on introducing climate change into formal education at all levels and the integration of climate change into curriculum and standards.

140. The project will build on general awareness-raising activities for key decision-makers and other trainings delivered by **the DRR Initiative** in BiH, including through adding climate risk management and flood risk management sessions in the trainings provided by **the DRR project**. Coordination will also be ensured with awareness-raising and communication activities implemented under **Sub-strategy for implementation of EU Flood Directive**. The SCCF funding will be used to improve the technical capacity and knowledge base for climate risk management and a long term adaptation planning for flood risk management. The project will do so by introduction of advanced tools and methods to establish the process of planning that is scientifically sound and evidence-based (Output 2.1). The project will also help the relevant government departments and other relevant institutions to improve their hydrometeorological

station coverage (Output 2.3) in this hazard prone region and improve the overall observation capacity; climate information storage, processing, analysis and dissemination protocols will be put in place (Output 2.2). Under the Output 2.4., the project will design and deliver the training programme to the government personnel (e.g. Water agencies) and other relevant stakeholders on climate risk assessment methods; and scenario based planning for water sector. To make sure capacities gained will be put into practice, the trainings will be delivered specifically to persons responsible for risk assessment, modelling, etc. in respective institutions. Training will range from one-off courses on specific topics, to on-the-job training, to longer term continued professional development, and may necessitate the use of third parties such as software/equipment vendors. Training will be provided to state and entity level staff and can be made part of respective inter-government/line-ministerial development planning, i.e. providing tools and guidance on how to integrate water management, flood prevention and climate risk management in annual, as well as longer-term plans. This will crucially be linked to local development plans. Importantly, the project will develop an institutional capacity strengthening plan which will include recommendations for long-term training, staffing, continued development and succession planning for effective flood risk management. This project will therefore aim to fulfil some of the objectives set out by the SNC for education and training and awareness-raising on climate change.

2.1. Improved hydrological and hydrodynamic model for the VRB incorporating climate change predictions developed to produce flood hazard inundation maps for spatial planning and emergency response planning, and for the long-term strategic flood risk management of the VRB

Output 2.1 deliverables

1) Established Spatial Data Initiative and data management system
2) Digitised historical hydrometric data for all stations in VRB.
3) Established and populated centralised hydrometric database with all available data for VRB
4) Hydrological and hydraulic model developed, calibrated and validated for VRB
5) High resolution flood maps produced for VRB to include the 2, 5, 20, 50, 100, 200, 500 and 1,000 year return period flood events.
6) 15 practitioners trained in hydrological and hydraulic modelling

Output 2.1 – Indicative Activities:

1) Establish a project Spatial Data Infrastructure (SDI). The project will establish a spatially enabled data repository which will serve to store, maintain and manage all information pertaining to the project, which will be provided as a data repository to support a Spatial Data Infrastructure, should there be a desire to develop a national SDI in the future. After project use the project SDI will be handed over to the appropriate government agency for long-term use.
2) The project will digitize, save and systematize/structure historical hydrometeorological observations, measurements and other data and link them to GIS systems that are essential for prospective planning.
3) The project will review the existing central hydrometric data base and assess the need to acquire or develop a centralised hydrometric database which will be populated with this historical data and will act as repository for incoming data from new automatic stations. It is envisaged that the database will be kept up-to-date in the future by providing systematic observations electronically (by either ensuring that monitoring stations are automated and linked to the database by telemetry, or by systematic provision of observations by monitoring staff from the Water Agencies, HMI and ICP).
4) Undertake detailed topographic surveys of the river channel through high risk areas including all major infrastructure across the river (e.g. bridges, dams etc.) and along river banks (e.g. flood walls, levees etc.).
5) Using the most appropriate modelling techniques, establish numerical hydrological and hydraulic models of the Vrbas basin based on detailed surveys of the physical characteristics of the river basin, and produce high resolution flood hazard inundation maps suitable for use in land use planning,

development zoning, flood risk mitigation design, establishment of flood insurance criteria, raising public awareness, and emergency planning. Maps will be produced for a number of different return periods and for a range of climate change scenarios.

6) Provide training in hydrological and hydraulic modelling to 15 practitioners with flood risk management functions at entity and local government level and identify long-term training needs.

Output 2.2. GIS-based vulnerability, loss and damages assessment tool and database established and institutionalized to record, analyze, predict and assess hydro-meteorological and other hazard events and associated losses

Output 2.2. deliverables

1) Socio-economic survey tool developed for systematic data collection
2) GIS-based socio-economic vulnerability loss and damages model developed
3) High resolution Vulnerability maps developed for VRB
4) Cost-benefit options analysis completed using the vulnerability loss and damages model to identify options that maximise benefits

Indicative Activities

1) Develop and codify methods and tools for undertaking socio-economic surveys to collect necessary information to fully map the socio-economic conditions of the rural poor, returnees and displaced person within the catchment.
2) Undertake socio-economic and vulnerability assessment to fully map existing vulnerability within the VRB, in order to identify the most appropriate adaptation options to reduce vulnerability within the Vrbas basin.
3) Engage and involve the community in the development of climate resilient adaptive measures that will meet their needs.
4) Develop a GIS-based tool to integrate various spatial socio-economic data with the flood hazard maps, perform vulnerability assessment, produce vulnerability maps which will include damages and loss of life estimates and to test flood management options.
5) Develop tools, methods, guidelines and procedures for recording flood events, undertaking post-event surveys and assessing vulnerability to flooding as well as assessing the effectiveness of flood mitigation measures in reducing vulnerability and damages. During the inception phase a user needs assessment will be undertake to determine definitively what tools will be developed.

Output 2.3. Hydro-meteorological monitoring system in the VRB upgraded (increased from 11 to 25 gauging stations) and harmonized into a central hydrometric system

Output 2.3 deliverables

1) 14 stations established as part of a central hydrometric system
2) Centralised hydrometric database established.
3) Operational plan for the optimised hydrometric network.
4) Institutional capacity development plan for hydrometric network O&M.
5) Training provided to 20 hydrometric specialists in the use, operation and maintenance of the optimised hydrometric network.

Indicative Activities

1) Review the existing coverage, physical condition and data collection procedure including the quality of data. Collect data from the relevant agencies to get the current station coverage, equipment installed, data period and data collection procedure. Structured questionnaires will be used to assess and record condition of the stations and to interview station staff.

2) Undertake an assessment of the monitoring network requirements for effective monitoring for strategic flood risk management, flood forecasting and early warning in the future and optimise the stations coverage. Undertake an assessment of the existing telecommunications infrastructure to support the telemetered and automated stations.

3) Provide technical and financial assistance to improve hydrometric monitoring network (undertake procurement of equipment).

4) Purchase and implement a centralised hydrometric database for Vrbas basin (and centralised hydrometric network).

5) Digitise all paper format data for VRB and systematise and store within the new hydrometric database. Establish guidelines, procedures, data sharing protocols and users manuals for the new hydrometric database.

6) Assess the institutional arrangements (to be led by the institutional specialist) for the operation and maintenance of the hydromet stations and suggest manpower and financial requirements, and training needs, for the efficient O&M of all the stations. Assess existing roles and responsibilities and the capacity of staff responsible for operating and maintaining the hydrometric network. Assess the existing protocols for the collection, transmission, sharing, storage, management and use of the observed data.

7) Prepare an operational plan for the hydrometric network including transmission of data, data management, data analysis and reporting procedures. The maintenance plan will cover the role of various aspects such as manpower, capacity, material and finance.

8) Provide detailed specification and design including costs of all equipment and each component of the hydrometric network specified including the detailed design and bid document for the stations for future rehabilitation / new installation.

9) Identify resourcing, and training needs as well as institutional arrangements for the management of the proposed new hydrometric network. Provide training for hydrometric staff in the O&M of up-graded hydrometric stations

Output 2.4. Institutional capacity strengthening plan developed and targeted training on climate - induced flood risk management provided to at least 100 relevant practitioners and decision makers (e.g. in Water agencies)

Output 2.4 deliverables

1) 100 practitioners and decision makers trained

2) Country wide training plan for climate-induced FRM

Indicative Activities

1) Undertake an assessment of state, entity and local capability from which gaps will be identified. This will be done by first undertaking institutional mapping which will identify the current composition of the relevant state, entity and local government departments to their functions in flood risk management. Having mapped the institutional capacity and assessed gaps and training needs, an institutional capacity building plan will be developed which will identify gaps in staffing levels and gaps in required skills, and will outline the recruitment and training needs to fill those gaps.

2) Add climate risk management and flood risk management sessions to the trainings provided by the existing DRR project to improve the technical capacity and knowledge base for climate risk management and a long term adaptation planning for flood risk management.

3) Introduce advanced tools and methods in FRM that are scientifically sound and evidence-based.

4) Examine the feasibility of establishing a University MSc. course in CR-FRM at local University.

5) Develop training plans for each technical area of expertise related to climate-induced flood risk assessment and management, and consolidation into an overall capacity development plan. Long-term capacity plan of BiH to consider options such as the development of internships and voluntary schemes for University students, in CR-FRM.

6) Provide training during the project (to be provided by each technical expert as part of their role on the job and as they undertake their role on the job). The benefit of this will be that the training will be part of the execution of the project so that trainees will be part of process and contribute to the end product. Training will be provided in the following:

   a. Information management covering hydrometeorological data, flood depths and land use. Once an information management system has been developed for the project, staff will be trained in its management and maintenance as well as the components of the system (such as GIS, data transfer, data quality assurance, data protocols, data sharing).

   b. Flood risk modelling and mapping methods (hydrological and hydraulic modelling). During the model development, training will be provided (to selected staff who are likely to be the custodians, users and managers of the flood model) in all aspects of flood risk modelling and the general techniques commonly used. In addition, training will be provided on the use of the specific modelling software that will be used to ensure that the local staff can take ownership of the model and use it in the future.

   c. Flood risk assessment: Participatory methods will be used to gather community information on flood risk in terms of how they have been affected by flooding in the past. This type of risk mapping will provide information to be included in the calibration and validation of flood risk models. Hence training will be provided to flood management practitioners, on how to gather information from the communities and how to engage with them for risk assessment. Flood management practitioners will also be trained in conducting post-event analysis using methods such as the UNECLAC methodology for Post-Disaster-Needs-Assessment (PDNA) methodology which outlines the methods for damages and losses assessment following a natural disaster.

   d. An important part of training would be to provide communities with the ability to asses local flood risks themselves, and to take appropriate actions such as building resilience into their houses and other structures, to manage their life stock to minimize flood impacts and to take appropriate actions to move themselves out of the way during a flood. There will also be a need to communicate the risks with the communities and enable them to comment on the draft flood maps. A program of dissemination of information tailored to the communities will need to be carried out.

   e. Development of early warning systems: enabling the communities and practitioners to jointly develop early warning systems, elaborating the components of a system, how they can be set up, options for response to an early warning, etc.

   f. Flood hydraulics and types of non-structural flood protection options that are able to cope with the new climate change induced flooding environment, which is significantly more volatile.

Outcome 3 - New technologies and approaches for enhanced flood risk management applied to increase resilience of vulnerable communities in VRB

Co-financing amounts for Outcome 3: $74,100,000

SCCF project grant requested: $2,780,000

Without SCCF Intervention (baseline):

141. One of the root causes of increasing vulnerability and costs of damage from floods is increasing exposure, resulting from the inability of the affected groups to withstand and recover from flooding. In addition, in the absence of more stringent regulations for flood zoning as part of the land use planning, irreversible adverse land use practices in the floodplain and the location of houses and economic activity (including subsistence agriculture) in the floodplain, are contributing to exposure. Lack of awareness of the risks and continued uncontrolled adverse practices, will further exacerbate the problem, and will increase the vulnerability and costs from flooding. Effective long-term decisions will only be possible by exercising multi-stakeholder engagement, especially participation of local communities and community groups. As described above there is a lack of human and financial capacities to respond effectively to flood risk at the municipal level and involvement of citizens in civil protection and citizen's awareness of flood emergency response is limited.

142. Existing flood protection structures are in a state of disrepair due to damage incurred in the war and a lack of funding for maintenance since then. In addition, the lack of up-to-date expertise in the field of flood hydraulic structures design in BiH including the lack of modern tools and approaches, as well as the lack of a centralised hydrometric database (hence lack of most appropriate and up-to-date data), means that existing flood defences, may not currently be providing an appropriate standard of protection, or would have exceeded their original standard of protection due to climate change and other changes in the basin since their construction. The Post-Disaster Rapid Needs Assessment (PDRNA) following the 2014 floods revealed that 49.2 Million USD in damages to flood protection and control infrastructure was incurred. In the 2014 flood event, the new flood embankment in Banja Luka was overtopped and breached, resulting in flooding of properties behind the defence. Similarly, in Celinac Municipality a flood wall in the town centre which was under construction was overtopped, and flood waters outflanking the bridge downstream of the defence works, undermined the bridge abutments, resulting in near collapse of the bridge.

With SCCF Intervention (adaptation alternative):

143. The project will work closely with entity authorities, municipalities, local representatives of the line ministries and local community groups to understand the risks and vulnerabilities (through vulnerability surveys mentioned in Component 2), and to develop appropriate flood management and mitigation measures with the full involvement of the community through Participatory Risk Assessment.

144. The project will develop an integrated flood risk management plan for the VRB, with the participation of local communities. This plan will take a bottom-up, multi-stakeholder, consensus-based approach. As part of the process the project will identify and initiate some of the priority flood management measures (e.g. community afforestation scheme on the flood plains; establishing locally controlled and managed flood zones; watershed rehabilitation works etc). The project will also ensure that tools and guidelines are put into place to enable future update and development of the plan. Importantly, the project will explore the options for incentives (through municipal job creation or loan / insurance repayment schemes) whereby the local population is systematically engaged in flood management solutions on the ground.

145. The agricultural sector has been identified as a highly vulnerable sector within the VRB and project activities will address these vulnerabilities as they relate to flood risk (with attendant benefits to drought risk management, or at least with no detrimental impact on drought risk management). Figure 6 shows Laktasi municipality with the estimated 2014 observed flood outline and the land cover within the flood outline. It confirms that the main receptor to flooding is agricultural land. A similar picture exists for all other municipalities. The project in developing and implementing an integrated land use and flood risk management plan for the VRB will focus on the following key activities:

- Assess and quantity the flood risks to agriculture by undertaking farm-level exposure to risk assessment.
- Assess and quantify the opportunities to use agriculture infrastructure for flood storage purposes and develop CC resilient feasibility studies for such infrastructure. This will involve working

closely with the World Bank's IDP project in their existing sub-project areas in the VRB (in this case Laktasi municipality) to assess such measures. In addition, this project will consider such opportunistic infrastructure measures in other parts of the VRB not currently covered by the WB IDP project.

- Develop farm level flood risk management strategies to include: Crop diversification, Crop yield insurance strategy, and forward contracting strategy.
- Develop methodologies to ensure that Climate Change is taken into account in upgrading of agricultural infrastructure systems.
- Provide farm level training in more flood-resilient agricultural methods.
- Provide non-structural FRM measures that will enhance improvements in agricultural protection from flooding (see below for more details about non-structural measures).
- Incorporate flood risk into the planning of land use specifically for agriculture.
- Identify and implement agriculturally beneficial flood management approaches such as agro-forestry that could enhance the agricultural sector, and at the same time, provide flood management benefits.

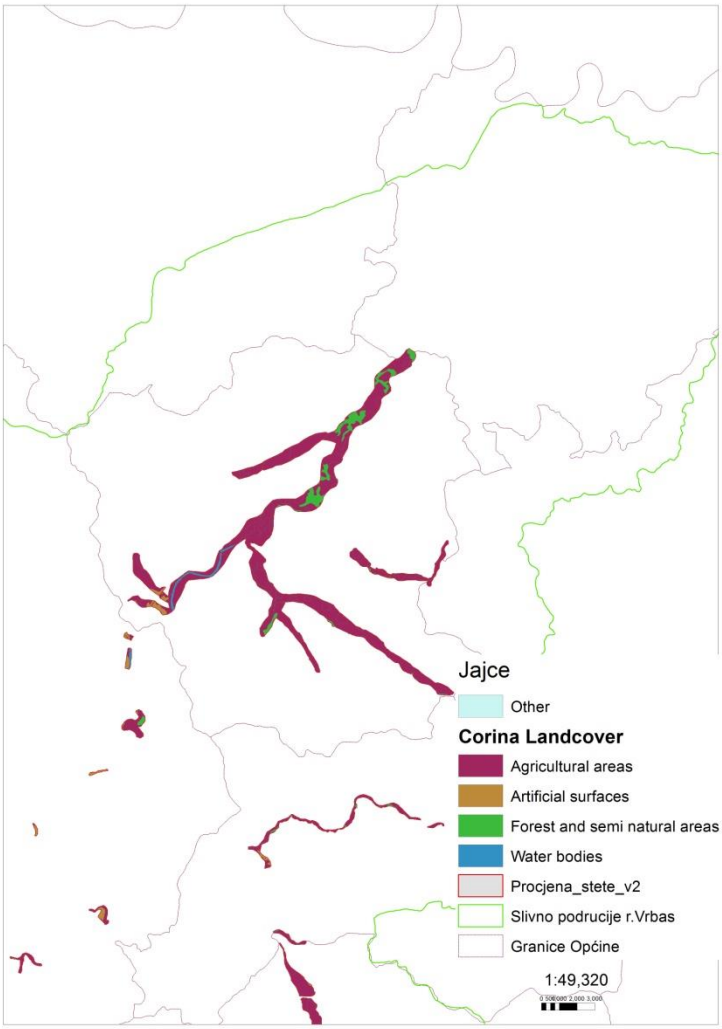


Figure 6: Flood affected land in Laktasi municipality

146. The floodplains of the Vrbas river basin support a large percentage of the agricultural activities and incur extensive losses to agricultural crops and loss of livestock when flooded. Extensive flood damages to floodplain cropland and the associated agricultural infrastructure are preventable with strategic agricultural practices including seasonal agriculture, designated cattle grazing and rearing pastures and agroforestry. Major forms of damage that can be addressed by strategic management of agricultural activity include flooding, debris accumulation, scour erosion, and sand deposition.

147. Agroforestry is a well-recognized measure for reclamation of flood damaged areas. It helps improve and stabilize the land; control runoff and soil erosion, thereby reducing losses of water, soil material, organic matter and nutrients. It also offers a productive land use option in the exposed floodplain areas that communities can benefit from. Some trees (hazelnuts, berry-bushes, other wild fruit-trees) have good combination of anti-erosion qualities (e.g. roots) and economic values (fruits) that augments their importance.

148. Given the challenges of balancing flood risk management and economic activity in the Vrbas basin there is a clear need to promote multiple-use of the floodplain to maximise productivity, as well as environmental and ecological enhancement and avoidance of flood damage to crops and livestock. The measures being proposed include increasing vegetative cover (through agro-forestry, vegetative bundles and trees) for slope stabilisation.

149. Floodplain agroforestry systems will be designed for the Vrbas basin, taking into consideration, all of the possible alternatives of maintaining productive agriculture while increasing environmental stability and protecting the agricultural infrastructure of the floodplains. A range of innovative techniques (such as bio-engineering technology) combined with integrated farm-level management will be employed to reduce exposure. The project will focus on community-based initiatives to ensure multiple and seasonal floodplain use approaches to enhance the social and ecological resilience of the floodplain. Municipalities will mobilize local communities and channel necessary resources, including the equipment for plantation works for windbreaks and bank stabilization functions. Municipalities will establish community-based monitoring and maintenance.

150. Conventional structural measures on their own, will become increasingly ineffective in terms of the Standards of Protection they provide, in the face of climate change, thus limiting the protection they can provide now and in the future.

151. In general, limitations of structural measures include:

- High cost and potentially long planning, design and construction horizons.
- Can sometimes result in the problem being moved elsewhere is the impact is not fully assessed during design.
- May result in complacency of ‘protected’ populations.
- There is a potentially increased impact and consequences if structures fail or are overtopped.
- Residual risk will remain as cost and other factors will limit structure to a given standard of protection (i.e. cannot protect against all events).

152. Based on experience, traditional structural flood protection measures like the building of reservoirs and embankments cannot always be adopted in areas susceptible to flash floods, which is the case in some part of the VRB.

153. Non-structural measures, on the other hand, have the following advantages:

- They do not require large investment in hard-engineered infrastructure (therefore generally lower cost).
- Rely on a good understanding of the flood hazard and how is will change under climate change.
- The can and often provide the first step in protecting people, in the absence of more expensive structural measures.
- Many of the measures, such as early warning systems, will form part of any flood risk management system.
- They are needed to manage residual risk associated with structural measures, where such schemes have been constructed.
- They include measures are more climate resilient and sustainable that structural measures and can generally be more easily adapted later on, should information about the hazard change.

- They generally involve the use of local natural material and vegetative cover to restore the physical, biological and chemical flood-plain functions to improve water saturation and transmission to minimize the damage.

154. They are normally natural and work with the existing landscape and can provide added benefits such as ecosystem services. Non-structural measures on their own or in combination with structural measures could provide the best solution to flood management and protection in the VRB. Knowledge of such advanced and climate-"smart" flood / flash flood management in BiH is limited and traditional hard engineering solutions prevail.

155. **Table 5** is a list of potential non-structural measures that will be considered for Vrbas basin at various locations. During project implementation, the optimal location of different measures will be identified and the solutions designed and implemented. A survey was done of municipalities' current use of non-structural measures which found that approximately 75% of municipality staff expressed a lack of knowledge of non-structural measures, but upon learning about them, were in full support of adopting such measures.

Table 5: Table of potential non-structural measures to be considered for use in the Vrbas basin

Technique name	Catchment location	Technique description
Floodplain reconnection	Middle / lower	Removed or lowered river embankments or new spillways to reconnect river channel to floodplain.
Selective bed raising / riffle creation	Middle	Technique used to repair damage from over dredging. Mimics river's natural sedimentation cycle processes.
Washlands	Middle / lower	An area of floodplain that is allowed to flood or is deliberately flooded during events above a defined magnitude.
Wetland creation	Middle / lower	Permanently wet areas where water levels are managed to allow some additional flood storage and high flow detention.
Two-stage channels	Lower	Techniques to build additional high flow capacity into a river channel. May involve the creation of wet berms and measures to maintain a narrow low flow channel.
Re-meandering straightened rivers	Middle / lower	Reintroduction or reconnection of river meanders to delay downstream time to peak.
Land and soil management activities to retain / delay surface flows	Upper / middle	tree planting, reduced stocking densities, moving gates and water troughs, planting cover crops, contour ploughing, maintaining soil quality.
Woody debris dams on streams and tributaries	Upper / middle	Naturally occurring or induced in-channel dams of woody debris and vegetation.
Land use changes – arable reversion	Upper / middle / lower	Reversion of arable fields to pasture to improve soil infiltration rates and reduce surface run-off.
Flood plain woodland, re-forestation	Upper / middle / lower	Creating or re-instating floodplain woodland to intercept out of channel flows and encourage infiltration.
Creation or re-instatement of a ditch network to promote infiltration (swales, interception ditches, etc)	Middle / lower / urban	Maintained road and track-side ditches to intercept overland flow and detain field and road drainage.
In-channel vegetation management growth to maximise channel roughness	Middle / lower	Alteration of channel vegetation maintenance regime to selectively promote in-channel vegetation growth.

156. The environmental benefits of non-structural measures will comprise a complex set of environmental attributes from which a range of market and non-market goods and services derive. These will include:

- Habitat creation through the restoration of the natural floodplain by zoning development away from the functional floodplain and creating flood ways.
- Maintenance/restoration of biodiversity by strengthening the functionality of the ecosystems.
- Enhanced land use management through the use of agro-forestry which will help to alleviate the current pressures of deforestation in the upland catchments as well as other harmful land use practices.
- Improvement in water quality and restoration.
- Improvement in water resources through improved infiltration, and transmission an all other functions of the full water cycle.
- Contribution to the development of a green economy by providing jobs and business opportunities to local people.

157. To identify the services to human populations and the use and non-use values these attract, a value transfer ecosystem services framework assessment can be applied, which links ecosystem services, final goods and services, the types of economic value and the relevant population (for the final services). Tracing from ecosystem services to final goods and services and the affected population in this way reduces the potential for double counting of benefits.

158. In general the environmental goods and services provided by flood management, relate to local and regional user populations in terms of the final benefits. The primary indirect user populations are households in the Vrbas catchment that benefit from flood risk reductions. In addition, local residents may also benefit from general improved environmental and recreation amenity. This may consist of both users and non-users. Specialist user populations (anglers, birdwatchers, etc.) may also be relevant.

159. The existing flood forecasting and early warning system for the VRB is manually based and ineffective. It is based on a hydrometric monitoring network which is inadequate and does not effectively capture the full spatial variability of hydrometeorological variables in the catchment. The current system also does not give the desired results because of organizational deficiencies, in particular because of complicated organization of transfer of instructions during and after natural disasters.

160. This project will support use of new technologies such as mobile phone application for EWSs. This will ensure availability of real time information on disastrous and hazardous events together with appropriate disaster-related information and advice to citizens and public sector and greater penetration of information to vulnerable groups such as women and children. The project will also support consultations between different stakeholders (including regional cooperation), with full proportional representation of vulnerable social groups. It is envisioned that strengthened local level disaster risk management will build resilience of local communities that are most directly affected by disaster and climate risks.

161. As part of the Integrated FRM plan to be developed for the VRB, the project will identify areas that can be used for such agro-forestry. Based on the extent of flood damages throughout the VRB, approximately 4,200 hectares of agricultural land has been flooded since 2004 (including 2014 floods). The project will aim to implement agro-forestry measures and practices on at least 20% of these lands. Hence the project will aim to implement agro-forestry measures on at least 840 hectares of land within the floodplain by 2018.

162. Index-based flood insurance is a financial instrument which has often been advocated as a long-term non-structural measure for building resilience among flood victims, and is one of a broad scope of risk management approaches that can be used to help zone development away from high risk areas. Under Output 2.4, the project will develop a GIS-based vulnerability took which will be based on the hazard mapping (flood depth, velocity and hazard) which will be mapped at the level of model grid cell resolution. Once overlain onto household-level receptor data (which will be fully characterised in socio-economic terms based on data collected and systematised under this project) will enable risk and vulnerability modelling and mapping at the household level. The risk model will be used (among other things) to identify the insurance risk zones and the premium to be set for each zone based on loss/damage, and other valuation information. A similar model has been recently developed for Georgia

and the project team will seek learning opportunities for implementing in the Vrbas. The project will explore the possibility of introducing an index-based flood insurance scheme for the Vrbas basin in coordination with the World Bank project SEEC Catastrophe Risk Insurance Facility APL3 (which is looking at Catastrope insurance for BiH) and will work with the SEEC CRIF project including consulting with the World Bank and/or Europa Reinsurance Facility Ltd before this indicative activity will be started, in order to avoid any potential overlap and to exchange lessons learned on the preparation of index-based insurance mechanisms in the region.

163. Based on hazard and inundation maps produced under the Component 2 and following some of the key floodplain policy measures that will be developed and implemented in Component 1, the project will invest in direct adaptation action and implement concrete long term climate resilient flood management activities, in selected high hazard risk municipalities based on the vulnerability assessment undertaken. Some of these "hot spot" locations have already been identified (see Table 1). It was intended that the selection of the thirteen focus communities will be finalized during the PPG phase, based on the following criteria: damages from flooding over the last 10 years, number of IDPs/returnees, poverty level, level of ownership from the community (level of co-financing). Based on 10 years of damage data, from 2003-2013, selection of target communities would have been in the upper and middle catchment. However, in the recent 2014 floods, the downstream catchment sustained the largest damages (**Table 2**). The type of damage was also different (high commercial and agricultural damages). Given the occurrence of this recent event and the difference it has made to the type and scale of damages, we will make further vulnerability assessments during the inception phase of the project to determine the target municipalities and communities in which to focus interventions. This approach will be basin wide and will ensure that the most appropriate locations are selected for interventions that maximises the benefits to the Vrbas basin as a whole. It will also examine the 2014 observed flood event against previous events to get the correct balance of targeted intervention. The selection criteria for determining where interventions will include an assessment of flood risk based on the detailed technical modelling and assessments of the whole basin, the willingness of municipalities to participate in the project and any co-financing opportunities or contribution in kind from the municipalities, or from other projects already underway in the municipality.

164. Measures to be implemented in identified hot spots will allow for upscaling of the adaptation measures and practices that will prove to be successful within the scope of the project. The structural and non-structural options will be identified and developed using the flood model to assess feasibility, and develop solutions based on a detailed consideration of climate change scenarios. This options-modelling in combination with the vulnerability mapping and socio-economic cost-benefit analysis (using the economics assessment tool to also be developed under Component 2) will be used to identify and prioritize preferred options or combinations of options which result in the most effective and holistic flood risk management for the basin. The integrated flood risk management plan will include a costed intervention plan (comprising the identified and designed structural and non-structural measures), a programme of implementation and an implementation management plan and will be developed in extensive consultation with, and involvement of all stakeholders, including the communities. It should be noted that this project will not fund the implementation of structural measures, but will undertake the feasibility studies for structural measures, to be funded by other projects in the future. In addition, the project will undertake feasibility studies for structural measures that have already been identified by the Water Agencies, but for which funding has not yet been identified. The advantage of this approach is that the project will provide direct support to structural measures and will ensure that the feasibility of these schemes are assessed in combination with the non-structural measures to be designed to ensure that the best combination is achieved. In addition, the feasibility studies will ensure that climate change considerations are embedded into the schemes, and that the most advanced methods, models and data (being developed in Component 2) are used.

165. The project will choose and conduct feasibility studies into the pre-planned projects identified by the municipalities. The choice of projects will be made in consultation with the municipalities and will be based on time and cost of the studies. Some of the projects which will be considered are:

- Jajce municipality - Regulation of the right bank in new industrial zone Lučno- approx 700 meters length.
- Donji Vakuf - Regulation of the right bank up to mouth of tributary Sušica. Approximately 1200 meters length.

- Gornji Vakuf - Regulation of Vrbas through settlements Voljevac approximately 400 meters and Pavić polje about 1200 m length.
- Banjaluka (EUR 1,000,000.00): Building of flood protection dam (1284m) and concrete parapet wall (195m) in Kumsale settlement.
- Srbac and Laktasi (EUR 10,000,000.00): Building of revetments (10km).
- Srbac (EUR 800,000.00): Watercourse regulation of Vrbas tributaries (1400m).
- Laktasi (EUR 900,000.00): Watercourse regulation of Vrbas tributaries (1800m).
- Banjaluka (EUR 11,500,000.00): Watercourse regulation of Vrbas (4500m).
- Banjaluka (EUR 2,700,000.00): Watercourse regulation of Vrbas tributaries (Vrbanja 2400m, Dragocaj 1100m, Rijeka 600m, Crkvina 800m).
- Kotor Varos (EUR 2,500,000.00): Watercourse regulation of Vrbanja (2500m).
- Mrkonjic Grad (EUR 900,000.00): Watercourse regulation of several nameless water flows (1400m).

166. The project will design and implement the identified non-structural measures to address flooding in the hot spot areas. The introduction of such methods of identifying, evaluating and prioritising structural and non-structural measures will utilise established best-practice methods from other countries. An advantage of introducing these methods is that it will establish a method of prioritising intervention options, based on all relevant data, and taking account of vulnerability. The methods will be useful in the future where limited funds are available for action, and can therefore help the country to better identify where limited funds should be spent in the future. This represents a transfer of both technology and best practice.

167. The proposed project will work with the Emergency Flood Relief and Prevention Project with the aim to incorporate modeling and vulnerability assessment results in the design of the hard structural measures to be implemented for the Vrbas basin. Ideally, the detailed design of structural measures would be deeply rooted in climate change adaptation and would be developed alongside non-structural measures to provide a catchment-wide strategic overview of the optimal options for Vrbas basin.

168. This SCCF Funding will be used to develop the overall Vrbas Flood Risk Management Strategy. Area specific plans will be developed to enable the implementation of the community-led or community-centred intervention measures. The project will focus on engaging with all local communities to ensure that they participate in the definition of the problems and the development of the solutions. The adaptation solutions will focus on transferring best available technologies for local level flood risk management. Extensive community surveys will be undertaken to help characterise the socio-economic status of the communities and to hear first-hand, what their issues are and what they would like to see as the solutions. Participatory Geographical Information Systems (PGIS) will be used as a means of integrating local community information into the assessments of the problem and the formulation of the solution and to strengthen involvement of communities or marginalized groups in decision making. A number of Participatory Rural Appraisal (PRA) approaches will be used to collect community-based data, including the use of interviews, questionnaires and the general use of ephemeral mapping, sketch mapping and scale mapping. The use of PRA is another example of technology transfer, which will then be promoted for further use in BiH.

169. A community engagement, mobilization and sensitization strategy will be prepared during the project inception phase and will be designed to target community groups and individuals in specific and individual ways to maximize participation. The community engagement, mobilization and sensitization plan will be provided to municipality and community group leaders for review and feedback.

170. A stakeholder analysis will be conducted using standard stakeholder analysis tools to ensure that all relevant players in the communities are involved in the project.

171. The community mobilization strategy will use decentralized structures to implement a participatory process using tools which will be developed aiming to capture relevant local knowledge and experience, current constraints and opportunities, and evolve a future vision for the targeted areas. The tools will include participatory assessment and planning methods, such as the following:

Method	**Description / Purpose**

Trends analysis	To seek local knowledge and past trends in various aspects of the community.
Visioning Processes	Based on the trends analysis, assess where the community would like to be in the next 10-20 years, what should be done for them to get there, and how they can be supported to get there.
Vulnerability Grouping	To identify vulnerability groups and how these can be differentially consulted and sensitised, what their views and needs are, and how they can be involved in the project.
Scoring	To rank various knowledge, practices, attitudes and skills in a particular community.
Mapping	To identify resources available in the community and how these can be sustainably utilised to improve the future and livelihoods of the community.
Focus group discussions	Especially to involve vulnerable groups so that they also participate in the visioning process of their community.
Venn diagramming	To identify institutions available and not available in the community, especially those that have power to influence the future of the community.

172. In order to fully assess the risks faced by all of the communities in the study area, and to ensure that the risk mitigation interventions are appropriate for each individual community, it is essential that each individual community is engaged in the assessment and consulted on the solutions.

173. A number of approaches can be used to collect community-based data, ranging from the use of existing published data about the communities (dependent on the availability of data), or using researchers/surveyors to engage directly with the community. For example Participatory GIS (PGIS) and local knowledge can be used to contribute to proper planning and resource allocation for disaster preparedness. Community information including existing infrastructure, demographic and socio-economic conditions as well as information on the damage and loss caused by previous flood disasters will be collected, building on the information collected during the development of the Integrated Flood Risk Management Plan and the Post Disaster Needs Assessment (PDNA) conducted in August 2014 in response to the April 2014 floods as necessary. Participatory Rural Appraisal (PRA) techniques, such as focus groups, will be used to highlight the most flood prone residential units as well as factors that contribute to flood vulnerability. Other methods of community involvement, such as the use of interviews, the use of questionnaires and the general use of ephemeral mapping, sketch mapping and scale mapping will be considered. In addition the project will examine the availability of data about the community and impacts from less obvious sources such as health facilities (who might have statistics on health issues escalating following a flood), insurance registers (if they exist) which could provide information on number and spatial distribution of claims for given flood events.

174. The community intervention plans will be developed and will include all types of interventions including structural measures and non-structural measures like community-based flood warning and emergency plans. The emergency plans will provide information on flood extent, time of first inundation and time of peak inundation at individual cells within the floodplain (and hence for specific properties, or infrastructure, or along routes). In addition it will show time of first inundation at key locations along the flooded area and time of peak inundation. This information can be used directly by emergency planners to plan how they access areas for rescue. The area intervention plan will also include the use of flood outline and hazard maps for raising public awareness by making the maps available to the public with location specific information about flood risk in their areas, such as time of flood arrival, (and hence time for evacuation), safe egress routes for evacuation, along with information on how to prepare to take action including evacuation. The project will develop ways of disseminating information via the internet, by flyers and information packs provided to individuals, or by posting location-specific flood maps and

information in community centres. The project will also develop ways of translating the flood outlines into concrete, visible markers on the ground to indicate different zones of given flood return period, and of given historical flood events (that communities will be aware of) so that the communities will have a physical, tangible representation of flood risk on the ground. Community intervention plans will also identify physical intervention measures such as (but not limited to), river bank stabilization, river dredging, drainage improvements, river embankment, dyke construction or rehabilitation, construction of check dams, although the project will only implement non-structural measures.

175. The overall community intervention plan will also consider methods of implementation which could be either labour-intensive or plant-based. For example, each municipality in VRB has its own public utility company (PUC), which is financed from municipal budget. These PUC's are called differently, their activities slightly differ, but in essence their main task is to take care of municipal/city hygiene. Hence the project will undertake training to increase capacity of PUC's and to include in their duties some of the flood prevention activities. The project will identify areas where FRM-related labour will be needed in the long-term beyond the life of the project to help maintain flood defences for example tree planting and floodplain agro-forestry methods. A long-term maintenance plan will be developed for this purpose.

176. Community intervention plans will describe the operational details of the planned mitigation, adaptation and early warning activities, including activity schedule, implementation and supervision responsibilities, procurement requirements and responsibilities (including at state, entity, district and community-levels), and costs. The plans will be operational documents that are easy to read and visual in nature to allow for meaningful interaction with communities. They will include detailed description of each intervention measure, including maps and images and other visual aids such as 3D visualisation of flooding. The plans will include the labour that will be required, overall implementation and will provide the community with a clear understanding of what will be implemented, by whom and with what input from the community, all developed with the detailed involvement of the community. The community plans developed will include an appropriate strategy to guide the implementation stage and to phase-out project support in a manner that ensures that project activities are effective and sustainable.

177. The project will roll out a direct campaign to make flood-prone communities aware of flood risks and means of effective risk management. The project will therefore aim to develop policies, methods and long-term practice of public participatory involvement in adaptive flood risk management in the Vrbas basin and will develop adaptive interventions that will improve the financial stability of the communities, which increase their resilience to climate-induced flooding. Interventions such as participation in flood insurance scheme, replanting of floodplain and hillslope vegetation and implementation of agro-forestry, and operation of a community-based flood monitoring and early warning system will be included. Such schemes will reduce flood risk and build resilience against climate change. When possible, awareness raising activities will be delivered to local communities through events organized by the Vrbas River Basin Environment and Tourism Development programme, which aims to work specifically with the communities living on the river banks.

178. Flood forecasting and early warning is a key non-structural measure which forms an important part of any flood risk management framework. To address the issue of effective emergency response at municipal level, the project will strengthen early warning capacity for the VRB by developing a fully integrated EWS which will include a central EWS (entity-based, as well as inter-entity and entity-state coordinated) and community-based EWS for the communities of the VRB. Coordination mechanisms created by the Clean Vrbas Project and to be created by the DRR Project will be used for this purpose.

179. The present forecasting and early warning system (FFEWS) for BiH is based on a simple procedure of manually reading and communicating rainfall and water levels, and this will need to be further professionalized and enhanced through the introduction of automatic monitoring stations where possible. This component will also help strengthen capacities and collaboration between all agencies with monitoring, forecasting, warning and response functions with respect to flooding and represents a key technology transfer opportunity. Given the size and complexity of the study basin, the flood forecasting and early warning system to be developed will be an integrated set of community-based, district and entity level approaches with well-defined procedures for exchanging information and clearly defined roles and responsibilities.

180. The community-based early warning systems will need to include a communications strategy for each municipality and each community. This would include a range of proposals for raising awareness of

the benefits and limitations of flood warnings. Depending on feedback from the consultations, this could possibly include initiatives such as community meetings, leaflets, plays and story-telling, radio/newspaper/TV involvement, school outreach/teacher information packs, placing painted flood markers indicating past flood levels, and regular community and area-level drills or exercises to raise awareness and test/improve procedures. Additional approaches could include the use of websites for information, forums, and social media. Different approaches may also be required depending on the frequency of flooding and likely impacts for given communities; for example for locations which experience devastating flooding every few years (low probability, high impact) compared to those which experience nuisance flooding on a regular basis (high probability, low impact) – with a spectrum of risk profiles in between.

Output 3.1. Integrated land use and flood risk management plan for the VRB developed and non-structural measures implemented by local communities (through Output 3.2.), government and/or private sector

Output 3.1 deliverables

1) Farm level flood risk management strategies for the VRB
2) Farm level training in more flood-resilient agricultural methods provided to 10,000 farmers
3) Agro-forestation scheme implemented on 840 hectares of floodplain
4) Feasibility studies for at least 3 non-structural intervention schemes
5) Index-based flood insurance scheme feasibility study undertaken and scheme developed and piloted in a selection of the13 flood affected municipalities of the VRB as appropriate
6) Detailed designs for at least 3 structural flood intervention options for VRB
7) FRM plan for Vrbas Basin comprising:
    a. A costed and prioritised list of options and activities.
    b. An activities programme based on packaging of the options.
    c. An Action Plan risk log – to be developed during implementation, for detailing and managing the risks associated with each main activity in terms of barriers to achieving the desired outcomes and the consequence or impact on the overall plan should the risk be realised. A detailed description of each option including the assumptions used in deriving costs.
8) Non-structural interventions implemented in 13 municipalities of the VRB.

Indicative Activities

1) Undertake a farm-level exposure and flood risk assessment for all agricultural land to fully characterise the exposure of agriculture to flood risk and develop a farm level flood risk management strategies for the VRB to include: Crop diversification, crop yield insurance strategy, and forward contracting strategy.
2) Assess and identify flood risks to agricultural infrastructure, as well as flood risk management opportunities associated with agricultural infrastructure under climate change and identify potential new infrastructure such as irrigation retention basins that could also serve as flood storage areas.
3) Provide farm level training in more flood-resilient agricultural methods.
4) Asses the floodplain agro-forestry potential of the VRB by undertaking the following activities:
    a. Review and consult with the ongoing WB project 'Sustainable Forest and Landscape Management Project' to better understand activities and align our project with ongoing activities where possible. In particular, their afforestation program will be of interest.

b. Investigate floodplain and hillslope agro-forestry approaches that will be appropriate to BiH (with both native and new species) and VRB in particular. It will be important to ensure that proposed agro-forestry solutions (especially where it involves introduction of new methods/crops) are appropriate to the BiH context and do not have adverse environmental impacts. A detailed floodplain agro-forestry study will need to be undertaken to determine what species of plants are appropriate for VRB.

c. Assess and identify likely impact of re-forestation of the upland areas of the catchment and agree these as priority areas with the government. Different re-afforestation scenarios can be modelled using the hydrological and hydraulic model to assess the impact on runoff, to inform future afforestation decisions. The advantage is that the model can be used to test each afforestation scenario under climate change.

d. Design an agro-forestation scheme to be implemented on 840 hectares of floodplain and develop an implementation plan for the scheme.

5) Undertake feasibility studies into an index-based flood insurance scheme for VRB and design and implement pilot Index-flood insurance scheme in 13 municipalities.

6) Develop a bottom-up, multi-stakeholder, consensus-based FRM plan for Vrbas Basin.

7) Develop long list of structural and non-structural options: This will involve developing an inclusive list of potential options for flood risk management looking at the whole VRB. The project will seek opportunities to attain the right balance between hard-engineering (structural) and soft-engineering (non-structural) flood risk management solutions.

8) Develop short list of options: The long list will be examined and qualitatively assessed in terms of the socio-economic, environmental, engineering and hydrological impacts of the options. These impacts will be summarized in an Appraisal Summary Table that will form the basis of the short listing process to be carried out in consultation with stakeholders.

9) Options assessment: The hydraulic impacts of the short-listed options will be simulated using the models developed for this study. An initial appraisal of the short-listed options will be carried out to determine technical performance in terms of flood damages reduction with and without intervention.

10) Outline capital costs of the options will be developed and will be compared with the options benefits (in terms of flood damages reduction) to derive benefit-cost ratios and identify the socio-economically preferred option(s) for each municipality.

11) Obtain feedback from the stakeholder consultation processes to refine the preferred option(s) and re-assess the technical and socio-economic performance of the option(s). However, it will be important to minimize required refinements by consulting with stakeholders at an early stage in the project, giving them sufficient time to respond or contribute ideas.

12) Feasibility and design: Once the preferred options have been identified feasibility, outline and detailed design studies will need to be carried out on each preferred option/flood alleviation scheme. As a minimum, feasibility studies for structural measures will include at least three locations within VRB.

13) Cost and quantity estimates of each finalized structural option will be carried out based on locally acquired cost data.

14) Plan will include the detailed design of non-structural measures such as community afforestation scheme on the flood plains, establishment of locally controlled and managed flood zones, watershed rehabilitation works etc., incentives based FRM schemes (through loan / insurance repayment schemes), Index-based flood insurance scheme.

15) Implementation of non-structural interventions in 13 municipalities of the VRB.

Output 3.2. Participatory community-based adaptation strategies, technologies and practices implemented in priority flood risk areas.

Output 3.2 deliverables

1) PGIS Tool established and managed
2) Training provided to 200 people in the use of the PGIS tool
3) Community engagement, mobilization and sensitization plans developed and implemented in 13 municipalities
4) Community Communications strategy for FFEWS developed and implemented in 13 municipalities
5) Community-specific Intervention plans with participation of the local communities developed and implemented in 13 municipalities
6) Community-based programs for FRM identified, designed and implemented

Indicative Activities

1) Undertake extensive community surveys to help characterise the socio-economic status of the communities and to hear first-hand, what their issues are and what they would like to see as the solutions.
2) Identify and review existing community-based programs of relevance and identify entry points into existing community-based schemes (e.g. through Water Users Associations).
3) Establish Participatory Geographical Information Systems (PGIS) approach and implement as a means of integrating local community information into the assessments of the problem and the formulation of the solution and to strengthen involvement of communities or marginalized groups in decision making. PGIS will be a tool included in the GIS-based socio-economic tool (or a separate tool to be used alongside it).
4) Develop Community engagement, mobilization and sensitization plans.
5) Develop Community Communications strategy for FFEWS.
6) Develop Community-specific Intervention plans with participation of the local communities.
7) Mobilise communities in the implementation in intervention plans

Output 3.3. Local communities (particularly women and refugees) trained to implement and maintain flood resilient non-structural intervention measures, including agricultural practices such as agro-forestry, to improve livelihoods of 13 communities in the VRB, and community-based flood early warning systems

Output 3.3 deliverables

1) Training undertaken to increase capacity of PUC's and to include in their duties some of the flood prevention activities. Up to 30 from each municipality trained in the maintenance of non-structural intervention measures.
2) Training provided in the operation of EWS (in the 3 pilot basins where community-based EWS will be established).
3) Training provided to communities within the 13 municipalities, on roles and responsibilities during flood emergency procedures.
4) Training provided first and second responders for flood emergencies – including drills and role play exercises.
5) Agro-forestry implemented on 840 hectares of land

Indicative Activities

1) Provide training to up to 30 employees in each municipality on maintenance of non-structural intervention measures. This will include bank maintenance, vegetation management (e.g. clearing channel banks of weeds and vegetation)

2) Provide training in the operation of EWS (in the 3 pilot basins where community-based EWS will be established)

3) Provide training for communities within the 13 municipalities, on roles and responsibilities during flood emergency procedures.

4) Provide training for first and second responders for flood emergencies – including drills and role play exercises.

5) The project will implement agro-forestry measures on at least 840 hectares of land within the floodplain by 2018.

Output 3.4. Early warning system in VRB modified to include the new hydrometric monitoring network as part of a fully-integrated flood forecasting system (comprised of centrally-based and community-based early warning systems). Municipal-level flood response and preparedness plans prepared and implemented

Output 3.4 deliverables

1) ToR for a full FFEWS for VRB.

2) Fully-integrated FFEWS for VRB implemented.

3) Institutional Arrangement plan for FFEWS for all BiH.

4) Flood forecasting models built and implemented for a fully-integrated FFEWS for VRB.

5) At least 2 community-based EWS's implemented.

6) Community EWS operators and practitioners on community-based EWS (50 people, 25 in each community-based EWS).

7) Public-facing website established for presenting key layers of information.

Indicative Activities

1) Development of the ToR for a full FFEWS for VRB (this will also support the identification of the optimized hydrometric network in output 2.3), also to inform the identification and development of appropriate locations for community-based early warning systems.

2) Review any existing flood forecasting programmes, or elements of FFEWS in BiH.

3) Assess current institutional arrangements and capacity for flood forecasting, flood emergency response and develop an institutional Arrangement plan for FFEWS.

4) Undertake telecommunications studies to determine the requirements to support monitoring and telemetry system as well was warning dissemination system.

5) Identify the requirement for flood forecasting model(s) (considering all appropriate industry-standard software or bespoke software) and develop the scope for flood forecasting models, for a fully integrated FFEWS.

6) Design and implementation of fully-integrated FFEWS.

7) Establishment of community-based Early Warning systems for VRB.

8) Community surveys to identify optimum locations for community based schemes.

9) Design of community-based schemes in consultation with local community.

10) Consultation with communities on proposed schemes.

11) Detailed Specification of equipment required for community-based schemes for 3 pilot sub-basins . Community-based EWS will be implemented in at least 3 pilot sub-catchments, to test the efficacy of such schemes. They are likely to be on tributaries which will not normally experience main-river flooding problems, and are therefore more isolated. The need for community-based schemes is

therefore greater in these areas as they may also not be 'connected' to any of the EWS for the main river. It also helps to ensure that equipment and systems are provided to catchments that may be overlooked in a wider EWS. At inception phase, the communities for which EWS will be the optimal solution will be identified based on a number of criteria.

12) Purchase of equipment to be installed (as part of 2.3 but this equipment will be specifically for the community-based FFEWS)
13) Installation of monitoring equipment with the assistance of community where possible
14) Training for community EWS operators and practitioners on community-based EWS
15) Final Implementation of the community-based EWS
16) Design of a public-facing website presenting key layers of information, with the potential to disseminate early warning information to the public
17) Early warning awareness and training workshops for community, NGOs, government and media representatives.
18) Produce guidance for the development of a flood forecasting and early warning system
19) Municipal-level flood response and preparedness plans prepared and implemented

2.5. Gender and vulnerable groups

181. In engaging with the communities, the project will pay particular attention to inclusion of vulnerable groups and particularly women to ensure that gender issues are taken into account. Gender affects all aspects of vulnerability in societies and there is a need to measure the difference in gender vulnerability to understand who will be at greatest risk in the event of a disaster and evaluate the differential impacts among different groups. One type of differential vulnerability between women and men arises from biological factors. Pregnant and nursing mothers are particularly vulnerable because of their increased need for food and water and their decreased mobility. As the primary caretakers of their homes, women tend to the needs of children, elderly and the disabled. This increases their workload and reduces their mobility in cases where quick evacuations are required or where they live a long distance from evacuation routes. Gender also influences the allocation of social and economic resources in ways that exacerbate women's vulnerability to natural disasters. Women generally have more limited access to the resources their families need for survival and recovery in the wake of disaster. Formal risk management tends to be male oriented despite the fact that women are custodians of family health and hygiene and providers of domestic water and food, all of which is affected by flooding. In addition, ECLAC studies have shown that, female reproductive health is often affected by flooding. The participatory flood risk and vulnerability assessment would also consider the details of each flood warning scheme in terms of the operational benefits, equipment required, staffing levels, organisational structures, output indicators, and ongoing commitment to maintain and keep the scheme functioning (and the assistance available on all levels). This project will aim to use participatory methods as much as possible and will ensure the inclusion of women in these participatory approaches.

182. In BiH there are large differences between the genders, in line with traditional gender roles. Men are more than twice as likely as women to be employed, self-employed or engaged in contract work. In general, male-headed households have higher incomes than female-headed households and overall there is a big difference in the income of male-headed households (780 KM/month) and single female households (431 KM), which emphasises the increased vulnerability of female-headed households. For effective flood risk management, the project will ensure that women are primary stakeholders and will therefore need to be involved in decisions on the types of solutions that are implemented.

183. An assessment of the gender-related baseline for each output of the project is presented in **Table 6**, and gender-specific target indicators are included. These indicators will be used to monitor the projects performance in achieving the right gender balance.

Table 6: Gender baseline assessment and targets to be achieved through each project output

Expected Outcomes	Baseline	Target Indictor
1. Key relevant development strategies/policies/legislation integrate climate change-resilient flood management approaches	No existing sectoral plans or policies include a gender responsive approach. Low gender balance in flood risk management	At least two priority sectoral policies and plans (e.g. agriculture, hydropower, water resources) to include gender disaggregated data, and use gender analysis in their design and included gender indicators for implementation.
2. Climate resilient flood risk management is enabled by transferring modern technologies and strengthening institutional capacities	Currently no sex-disaggregated data collected in VRB. Loss and damages assessment do not include gender-specific tangible and intangible losses	Introduction of sex-disaggregated data collection protocols and methods. Introduction of GIS-based vulnerability, loss and damages which incorporate gender specific vulnerability, loss and damages calculation methods (e.g. ECLAC method)
3. New technologies and approaches for enhanced flood risk management applied to increase resilience of vulnerable communities in VRB	Community-based adaptation strategies, technologies and practices do not secure participation of women, nor include them in trainings and communication circles.	Secured minimum of 40% of women in participatory community-based adaptation strategies, technologies and practices implemented in priority flood risk areas
	Early warning systems and Municipal-level flood response and preparedness plans are gender blind.	Early warning system in VRB and Municipal-level flood response and preparedness plans are fully engendered.

2.6. Key indicators, risks and assumptions

184. Section 3 below contains results framework which includes project impact and performance indicators while Annex 1 lists project risks and assumptions.

2.7. Cost-effectiveness

185. The project is cost-effective in as much as it implements flood management measures that are more resilient to long term impacts of climate change on hydrological dynamic and increased frequency and intensity of climate hazards. The country that loses on average 5-15% of GDP as a result of floods of magnitude similar to those of 2010 and 2014 events and has overall municipal budget that are, on average 47% of flood damages annually, requires a more long term vision to effectively prevent and adapt to climate hazard risks that are to be exacerbated based on regional and national climate change scenarios. To assess the cost effectiveness of the project, two different scenarios have been examined. The first is an alternative project approach which seeks to address flood risk by structural intervention measures only, while the second is the business-as-usual (no project) scenario.

Alternative project approach – Structural intervention

186. A plausible alternative approach to the current project design would be to implement structural intervention measures to address flood risk in the VRB. The estimated length of flood defences that would be required to protect areas that experience flooding on a regular basis is 141.3km. Assuming a cost of approximately $0.5 Million USD per 1km of defence, this would require 67 Million Euros to protect all currently flooded areas in the basin. This does not take account of climate change, nor the annual maintenance cost of flood defences. If the project budget of $5 Million USD were to be distributed among the 13 municipalities that experience flooding on a regular basis for flood defences, each municipality would receive $384,615 USD, which would not be sufficient to construct 1km of flood defence in any given municipality. Even if the 5 Million was spent on one main flood defence, it would not yield very much in terms of the size of the population that would be defended by that one structure. The cost to benefit ratio would therefore be very low. The discussions in Component 3 have already highlighted the pros and cons of structural and non-structural approaches to flood protection. In the Vrbas basin and in BiH in general, traditional structural measures have proven to be ineffective when used as the sole flood risk management approach, due to their high capital and maintenance costs. While this project will transfer technology by introducing modern tools and approaches to the design of defences, it would not be cost effective to spend SCCF funds on the construction of what would be limited and ineffective flood defences.

Business-as-usual Scenario

187. Tables 1 & 2 show the damages caused by flood in VRB for the past decade and for the 2014 event respectively. On average, 3Million USD damage was incurred in VRB per year over the period 2003-2013. In 2010 VRB incurred 15.7 Million USD in damages. In 2014 2.9 Billion USD of damages was experienced in BiH, with 87 Million USD for damages reported in VRB. The return period of the 2010 rainfall was approximately 1 in 20-25 years, while the 2014 event has been estimated at a return period of 1 in 500 years. Assuming that the current situation is the Do-Nothing (baseline or no-project) scenario, it is reasonable to assume that the Do Something scenario (the project) will achieve 100% benefits for VRB basin for normal floods (i.e. average annual damages of 3 Million USD averted, or 15.7 Million USD averted if the 2010 event is considered). The Do-Nothing Present Value damages is assumed to be 100% of the damages in any given year. The PV cost is the cost of the project (5.00 Million USD). Hence with 100% damages averted the benefit-cost ratio for VRB is 1.7, if only the average annual damages are averted, 3.14 if the project delivers a standard of protection equivalent to the 2010 equivalent PV benefits, and 17.4 if protection against events of the size of the 2014 is achieved. The project will seek to deliver Standards of Protection of greater than the 1 in 25 year but less that the 1 in 500 year (international best practice standard is 1 in 100 year for populated areas and lower for non-populated areas, depending on the land use). Hence it is reasonable to assume that the cost-benefit ratio for the project will lie between

3.14 and 17.4. The project will undertake more detailed assessment of economic benefits of each component, and for the project as a whole, which will provide a better assessment of benefit-cost ratio.

188. The above damages analysis does not include the government's contributions to annual maintenance of the flood defenses, as these are business-as-usual costs associated with the government's normal annual budgets to deal with flooding emergencies. The damages data used in the analysis are on top of the government's business as usual costs, and so the analysis shows the government expenditure over and above its annual budget, to deal with flood risk. The cost-benefit analysis is therefore more in line with a 'business as usual' scenario (or Do Minimum) than a Do nothing. Do nothing is therefore used in the context of 'No project'. The analysis shows that if the government continues to undertake reactive, reparatory and ad hoc measures, it will continue to fail to effectively respond to flood risk. If the project is undertaken and provides benefits through its basin-level and long term climate change resilient flood management measures, then the benefit to cost ratio is 3.14 to 17.4. It is not possible to quantify the benefit provided by other funds as, although there are other projects in the region, none provides the level of intervention and hence benefits that this project would, because the technical and geographical focus of other projects are not are comprehensive as this project.

189. The current approach to flood risk management in BiH is largely reactive, with DRR interventions focusing on response, recovery and compensation. This includes the implementation of works to reconstruction/repair flood defences to existing levels thus providing the same standard of protection despite the increasing risk (frequency and magnitude) of failure of defenses under climate change. Indeed present disaster risk reduction activities in VRB are mainly focusing on developing local capacities to cope with regularly recurring floods. These actions are not taking into account the changing magnitude and frequency of floods, and long-term efforts to adapt to changing climate. Thus this proposed project is the first ever attempt to address long-term flood management measures and strengthen capacity of relevant institutions.

190. The aim of this project is to put in place, long-term flood management measures which will enable the government of BiH to manage flood risk in a more sustainable manner. Flood plain management measures such as development zoning, for example, should reduce the need for response and recovery as the populations at risk will be greatly reduced. In addition, the need to compensate for flood damage will be reduced, as fewer properties will be affected by flooding. Under this project, direct measures including the construction of structural defenses which take account of climate change will provide a higher standard of protection that takes account of changing flood levels with climate change. This will reduce the risk of defense structure failure (operational and structural failure). Under this project a number of direct intervention structural measures will be implemented, which will complement and improve on the government's annual flood defense work. This project therefore offers the critical long-term adaptation and climate resilient flood management measures required for the basin. It will also develop and provide the tools (e.g. modelling, monitoring, forecasting and early warning) that will enable the government to manage flood risk in a more sustainable and cost-effective manner.

2.8. Sustainability

191. The project is the first in BiH to attempt to manage flood risk at the river basin scale, by considering all of the key requirements of flood risk management including, legislative and policy-based landuse and floodplain management, development and strengthening of institutional capacity to manage climate-accelerated flood risk, and with community based, participatory methods for building resilience to flood risk.

192. Through Component 1 the project will be the first in BiH to attempt legislative change to enable flood risk management and to link land use and spatial planning, control and management to flood risk management. The key benefit of this approach is that, it will help to zone people, property, and economic activity away from high flood risk zones under climate change. In addition this approach will provide opportunities for the floodplain to re-establish its natural functions. Importantly, the approach will be

scalable to other basins since the legislative change will be at state level thus ensuring the sustainability of the approach.

193. Through Component 2 the project will enable the state and sub-national governments to effectively undertake flood risk management in the future, through the provision of the appropriate tools and technology and by strengthening capacity in risk management through training. The project will adopt a 'Training the trainers' approach which will ensure sustainability and continued development of capacity in BiH. This will be the first project to develop a river basin scale flood modelling and mapping approach and develop an integrated flood risk management plan to identify the most appropriate intervention measures for the basin.

195. Under Component 3 the project will be the first in BiH to specifically target returnees, displaced persons and the rural poor and to map the vulnerabilities of these marginalized groups. The project will be the first to implement community-based participatory approaches and to systematize the mapping of socio-economic statistics on vulnerability and provide tools for long-term assessment of vulnerability. It will provide bottom-up community based training as well as train the trainers approach to ensure sustainability.

196. The project will develop community based approaches to flood risk management which will involve the vulnerable communities directly in the implementation, and long-term management of flood mitigation measures and in so doing will provide employment opportunities for the marginalized communities of the Vrbas basin. The project will implement community-based early warning systems with the help of the local communities and provide employment opportunities to enable the communities to run and manage the warning systems themselves. This will give ownership of the system to the communities and in so-doing ensure its sustainability. In addition, the community-based early warning system will be linked to a centrally based system, which will give communities the chance to contribute to the wider flood risk management within BiH.

2.9. Replicability

197. The project is highly replicable since it deals largely with technology and knowledge transfer. In essence, the project will be establishing the tools, systems, legislation and policy framework which will ensure that it is upscable and replicable to other basins. For example, the Flood forecasting and early warning system which will be established for VRB will be centrally based and the underlying models can be extended to include models and forecasts for other basins. Moreover, since there is a strong focus on capacity development of in-country practitioners, decision makers, and communities, replicability will be ensured.

198. It should also be noted that the project will be conducted in parallel with the World Bank's Drina River Basin project which has very similar objectives and activities. As discussed above this project will work closely with the Drina project to ensure that methodologies and approaches align, and that these are codified and provided as country wide guidelines. This will ensure replicability of the projects to other river basins in BiH.

199. The project will contribute case studies, lessons learned as well as regular implementation updates to the UNDP Adaptation Learning Mechanism (ALM), which will further ensure replicability of successful approaches.

2.10. Stakeholder involvement plan

200. The list of stakeholders consulted during the project preparation is provided in Annex 5 and the Stakeholder engagement plan is in Annex 6.

201. On state and entity level, ministries responsible for water management, water agencies, hydro meteorological institutes, climate change focal point in BiH (Ministry of Spatial Planning, Construction, and Ecology of Republika Srpska) and other environment related ministries, as well as civil protection were invited to participate in project preparation. On entity and cantonal level, political, operational and executive jurisdictions for water sector rest with line Ministries in charge of water. On local level, in the project preparation phase the project has mapped all stakeholders in the project area and created a reference group in each municipality. Civil protection organizations and representatives from municipal government actively participated in the project preparation. All organisations consulted provided data and information requested during interviews, questionnaires and phone consultation.

202. The project includes extensive consultation activities including the following:

- Establishment of an inter-agency working group to help outline and examine the current policy framework relating to water and flood risk management in BiH and which could best elaborate current practice and deficiencies with respect to FRM and the inclusion of climate change considerations. The working group will be comprised of representatives from all relevant agencies and organisations across entities, and will be a primary forum for wide inclusion and consultation from the beginning and throughout the process to ensure buy-in to all aspects of the project activities, in particular the proposed changes to policies strategies and plans to embed climate change. This approach will enable an active participatory approach and will engage with experts from relevant line-ministries and water agencies, ion development of sectoral policies.
- Consult with sector leaders on final proposed new sector policies, strategies and plans, including an invitation to comment and make recommendations on the changes.
- Consultation with all stakeholders the proposed flood zones and on the proposed designated/permitted landuse activities with the flood zones.
- Engage and involve the community in the development of climate resilient adaptive measures that will meet their needs.
- Consult with the ongoing WB project 'Sustainable Forest and Landscape Management Project' on afforestation program.
- Consult relevant stakeholders on structural and non-structural flood management options
- Obtain feedback from the stakeholder consultation processes to refine the preferred option(s) and re-assess the technical and socio-economic performance of the option(s).
- Undertake extensive community surveys to help characterise the socio-economic status of the communities and to hear first-hand, what their issues are and what they would like to see as the solutions.
- Develop and implement Community engagement, mobilization and sensitization plans.
- Consultation on the proposed EWS and in particular consultation with communities on proposed community-based EWS schemes.
- The project will design and implement a public-facing website presenting key layers of information, with the potential to disseminate early warning information to the public. The website will also be part of the Participatory Assessment, which will enable stakeholders to upload information and provide opinions.
- The project will produce an article and footage every year to showcase what has been done and what has been learned annually.

2.11 Compliance with UNDP Safeguards Policies

203. Environmental and social aspects of this project were reviewed against UNDP safeguards requirements and the following recommendations developed:

204. Within the first project component, UNDP will ensure that foreseen policies, rules, regulations and management tools (such as marking the flood risk areas, rules and regulations for development control and relocation activities from high risk areas and other) are fully compliant with human rights approach. Every decision, rule, regulation and similar, to be made and adopted by the authorities shall comply with local legislation and shall ensure effective and informed participation of stakeholders in the formulation and implementation of those regulations. Establishment of new or change of existing regulations on flood protection at any level of authorities within the VRB will include the aspect of gender equality and incorporation of the principles of sustainable management, protection, conservation, maintenance and rehabilitation of natural habitats and their associated biodiversity and ecosystem functions. Proposed solutions will consider the risks of habitat loss, degradation and fragmentation, hydrological changes, nutrient loading, and pollution. No project activity will be implemented in areas of critical or protected habitats and shall not propose alien species known to be invasive into new environments. The relevant regulations shall promote the use of techniques, technologies, systems and processes which do not generate significant GHG emissions and which will not lead to increased exposure and/or vulnerability to climate change. While proposing new or amending the existing regulations, consideration will be given to avoid physical and economic displacement in fact to anticipate and avoid, or, when avoidance is not possible, minimize adverse social and economic impacts from land or resource acquisition or restrictions on land or resource use.

205. The second project component could have adverse environmental and social consequences. While assessing the groups' and areas' vulnerability in the VRB as part of the GIS database establishment process, particular consideration will be given to avoid any negative or discriminatory consequences to marginalised population groups such as returnees, Roma and others. Potential discrimination could be present in case if mentioned categories are omitted or their importance is reduced in GIS database and tools for assessment of vulnerability, losses and damages caused by floods. Result of this component is transfer of modern technologies and strengthening institutional capacities in climate resilient flood risk management, so it will be necessary to emphasize women's equal rights, combating discriminatory practices. While implementing assessment on groups' and areas' vulnerability within the VRB as a part of the GIS database establishment process, particular consideration will be given to equal participation of women and men in identification of significant elements for GIS database and other tools addressing the flood protection. Establishment of tools, databases, monitoring systems, methods, models and procedures to enable efficient flood risk management, will ensure use and representation of the principles of sustainable management, protection, conservation, maintenance and rehabilitation of natural habitats and their associated biodiversity and ecosystem functions. Since reconstruction and revitalization of the existing measuring units at Vrbas river and its tributaries is planned, it will be ensured that the used equipment does not affect biodiversity and eco-systems in the VRB, and that the used techniques of installation and connection to central hydro meteorological system do not generate significant GHG emissions and that all equipment complies with the highest energy and environmental standards. While installing and establishing the work of measuring units, use of mechanisation and equipment that could adversely impact the quality or flow or water in the VRB will be avoided. While conducting the works on installation and reconstruction of measuring units and their connection to the central hydrometric system, respect and promote workers' rights, fair treatment, non-discrimination, and equal opportunity for workers, and also provide workers safe and healthy working conditions and prevent accidents, injuries, and disease.

206. Of all project components, the third component might have the most important impact on environmental and social benefits and risks, because it includes development of flood risk management plan for the VRB as well as implementation of specific long-term measures that should reduce the damages and vulnerability to floods. Development of the plan for the VRB, including significant participation of local communities, and implementation of specific flood management measures will fully comply with human rights and fundamental freedoms for all without distinction as to race, sex, language or religion. Implementation of specific flood management measures shall not be discriminatory to anyone and UNDP shall try to implement measures, respecting the needs and enabling benefits, for all categories of citizens regardless their race, sex, language or religion. Considering that development and establishment of the flood risk management plan for the VRB will be a participatory process including participation of local communities and citizens, intensive participation of women in identifying the issues and defining the solutions for local communities within the VRB will be necessary. Implementation of

specific priority flood management measures will not be formulated or dimensioned in a way to discriminate women or to impede their daily lives and work (this particularly pertains to measures that could affect agriculture and difficult access of women to agricultural production resources). Development of flood risk management plan for the VRB and early warning system in the VRB, shall ensure the use and representation of the principles of sustainable management, protection, conservation, maintenance and rehabilitation of natural habitats and their associated biodiversity and ecosystem functions. Through proposed solutions in the flood protection plan, address environmental issues and all proposed solutions from the flood risk management plan and early warning system in the VRB shall include use of techniques, technologies, systems and processes not causing the increase in greenhouse gas emissions. Particular consideration will be given to specific priority flood management measures foreseen by the project (e.g. floodplain reconnection, washlands, wetland creation, land and soil management activities, re-forestation and other). Each of these measures could affect the biodiversity and eco-system so it is very important that the process of measures' use is implemented in a way to avoid or maximally reduce the risks of habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, nutrient loading, and pollution. Within the afforestation process or other ways of plants cultivation that could help in flood protection and reduction of damages, under no circumstances alien species known to be invasive will be introduced into new environments. Plan for the VRB, early warning system in VRB and participatory community-based adaptation strategies, technologies and practices will require use of techniques, technologies and processes not generating significant GHG emissions and not contributing to increased exposure and/or vulnerability to climate changes. Afforestation and plant cultivation measures, ensuring the sinking of greenhouse gases, particularly carbon dioxide will particularly contribute to this. Generation of hydro accumulations and swamps as techniques for reduction of hazardous flood effects must be well considered because they affect the increase of methane emissions. All measures to be implemented during the project will aim to preserve health and security of local communities through reduction of vulnerability to floods. Previously mentioned possible flood management measures (afforestation, controlled flood areas and similar), shall be implemented according to the rules of professional and in compliance with the laws thus not violating health and security of communities in the region. While conducting the works and implementing flood protection measures, consideration will be given to respect and promote workers' rights. Priority flood risks management measures shall be implemented in a way to protect cultural heritage and avoid its alteration, damage or removal. Establishment of controlled flood zones, channels and other measures will be strictly implemented in areas where there are no signs of cultural heritage. Also, it will be ensured to avoid physical and economic displacement in fact to anticipate and avoid, or, when avoidance is not possible, minimize adverse social and economic impacts from land or resource acquisition or restrictions on land or resource use.

207. UNDP shall ensure that the solutions from the flood risk management plan for the VRB and participatory community-based adaptation strategies, technologies and practices, avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution. Implementation of the priority measures must meet good international practice in this regard, and must be harmless to environment and as efficient as possible in terms of consumption of resources, particularly energy. While conducting the works and activities on implementation of measures, it will be required to comply with the highest environmental standards and local legislation regarding the protection from water, air and land pollution.

3. Project Results Framework

This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD: Lead output: Output 5.2: Subnational actors implement climate change adaptation (CCA) and mitigation measures, sustainable energy access solutions, and manage natural resources sustainably. Complementary Output 5.1: Harmonized policies and legal frameworks enforced in accordance with international obligations. Complementary Output 3.2: UNDAF outcome 3. By 2019, there is effective management of war remnants and strengthened prevention and responsiveness for man-made and natural disasters, Output 2. Legal and policy frameworks in place supporting implementation of disaster and climate risk management measures, including gender perspective					
Country Programme Outcome Indicators: Outcome 5: By 2019 legal and strategic frameworks are enhanced and operationalized to ensure sustainable management of natural, cultural and energy resources.					
UNDP Strategic Plan Environment and Sustainable Development <u>Primary</u> Outcome: Outcome 2.4: Scaled up action on climate change adaptation and mitigation across sectors which is funded and implemented					
Applicable GEF Strategic Objective and Program: Objective 3: Adaptation Technology Transfer: Promote transfer and adoption of adaptation technology					
Applicable GEF Expected Outcomes: Outcome 3.1: Successful demonstration, deployment, and transfer of relevant adaptation technology in targeted areas Outcome 3.2: Enhanced enabling environment to support adaptation-related technology transfer					
Applicable GEF Outcome Indicators: Indicator 3.2.1 Policy environment and regulatory framework for adaptation related technology transfer established or strengthened Indicator 3.2.2: Strengthened Capacity to transfer appropriate adaptation technologies					
	Indicator	**Baseline**	**Targets** **End of Project**	**Source of verification**	**Risks and Assumptions**
Project Objective: **To transfer technologies for climate resilient flood management in order to increase resilience of highly exposed rural poor, returnee and displaced persons communities in Vrbas River Basin**	Number of new technologies transferred to BiH as part of a methodology for strategic FRM AMAT indicator 3.1.1.1 Type of adaptation technologies transferred to the target groups.	Limited institutional capacity and technologies in use for strategic FRM in BiH	At least 5 new technologies introduced (hydrological and hydrodynamic modelling, state-of-the-art monitoring equipment, Flood forecasting and early warning systems, flood damages and losses modelling and vulnerability assessment, and a number of non-structural flood management technologies to BiH)	Project monitoring reports and final evaluation Survey of Adopted policies and plans Survey of Technologies in place	Risk: Government bodies do not pay sufficient attention to climate change Governments on state and entity level are not able to reach an agreement on supportive regulatory documents and management plans Risk rating: low Assumption: Government will understand importance of CC induced flood risk management and provide support to regulatory documents
	VRB (12% of BiH territory) covered by an automated hydrometric monitoring network for effective Flood Forecasting and Early Warning	Hydrometric stations currently cover 50% of the area required for FFEWS for VRB	The VRB (i.e.12% of BiH) covered by a Hydrometric network that provides the optimal coverage required for FFEWS		

Outcome 1: Key relevant development strategies/policies/legislations integrate climate change resilient flood management approaches	AMAT Indicator 3.2.1 Policy environment and regulatory framework for adaptation related technology transfer established or strengthened	1: No policy/regulatory framework for adaptation related technology transfer in place	4: Policy/regulatory framework for adaptation related technology transfer have been formally adopted by the Government but have no enforcement mechanisms	Project annual reports, Mid-term evaluation, final report Survey of Policy/regulatory framework in place	Risk: Consent to Policy/regulatory framework not given by all government levels Risk rating: Low Assumption: political support provided
	No, of Adaptation technology solutions for climate resilient flood management (CRFRM) enabled for implementation	0: Document codifying standard methodologies and procedures for Climate resilient flood Risk Management (CRFRM)	At least 10 guidance documents produced on Climate Resilient Flood Risk Management topics	Project annual reports, Mid-term evaluation, final report Survey of Guidance documents developed	No risks identified
Outcome 2: Climate resilient flood risk management is enabled by transferring modern technologies and strengthening institutional capacities	AMAT Indicator 3.2.2: Strengthened Capacity to transfer appropriate adaptation technologies	1: Very few professional are aware of adaptation technologies	3: High Capacity achieved (>75%). Provision of models, information systems, tools and training in the use of these to professionals, on various aspects of climate adaptation technologies	Project annual reports, Mid-term evaluation, final report	Risk: Management of relevant institutions do not recognise a need to such a training Risk rating: low Assumption: a need for a training recognized
	No, of institutions enabled to modify risk management strategies based on introduced vulnerability, loss and damages assessment and improved hydrometric monitoring technologies	Most of the socio-economic information required to assess flood damages, losses, exposure and vulnerability is not currently available and is not collected systematically and gender-disaggregation of data not systematically done.	GIS-based flood damages, losses and vulnerability assessment tool developed for VRB and systematic socio-economic survey methods established and implemented for VRB and introduces sex-disaggregated data collection protocols and methods	Project annual reports, Mid-term evaluation, final report GIS data base	Risk: institutions not willing to provide and/or do not have data Risk rating: medium Assumption: data will be gathered on the field

Outcome 3: New technologies and approaches for enhanced flood risk management applied to increase resilience of vulnerable communities in VRB	No, of people in target basin benefitting from FRM adaptation technologies, tools, and adaptation strategies, and are less exposed to flood risk	Current approach limited of inclusion of local communities, and particularly the vulnerable groups	At least 5 technologies transferred to 13 communities in community-based adaptation measures	Project annual reports, Mid-term evaluation, final report	Risk rating: medium Assumption: interest of local communities in innovative solutions
	No, of innovative Non-structural measures introduced and implemented as part of climate adaptation strategies to provide improved resilience to communities (include agric.	Current approach to FRM is structural flood protection measures	Non-structural measures designed and implemented in 13 municipalities by 2020 At least 4,200 hectares of agric. land protected by non-structural measures (e,g. floodplain agro-forestry to be implemented on at least 840 hectares)	Project annual reports, Mid-term evaluation, final report Survey of Implemented measures	Risk: agreement between local governments on selected measures not reached Risk rating: low Assumption: local governments work for the overall gain, and interest of local communities in innovative solutions
	No of communities benefitting from introduced forecasting, early warning, response and recovery technologies to support local communities at risk of flooding	FFEWS system currently disjointed and not fully electronically based	Fully integrated Flood forecasting and Early warning system implemented in VRB	Project annual reports, Mid-term evaluation, final report Assessment of FFEWS in place	Risk: data gathered not disseminated timely to all citizens Risk rating: low Assumption: capacities strengthen in order to recognize importance of data

4. Total budget and workplan

Award ID:	00083690	**Project ID(s):**	00092036
Award Title:	Technology transfer for climate resilient flood management in Vrbas River Basin		
Business Unit:	BIH10		
Project Title:	Technology transfer for climate resilient flood management in Vrbas River Basin		
PIMS no._____	5241		
Implementing Partner (Executing Agency)	UNDP		

GEF Outcome/ Atlas Activity	Responsible Party/ Implementing Agent	Fund ID	Donor Name	Atlas Budget. Account Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Amount Year 5 (USD)	Total (USD)	See Budget Note:
OUTCOME 1	**UNDP**	**62180**	**SCCF**	71200	International Consultants	85,000	71,500	26,000	17,000		**199,500**	1a
				71300	Local Consultants	39,000	30,000	26,000	10,000		**105,000**	1b
				71400	Contractual services – indiv.	9,950	17,500	17,500	17,500	17,500	**79,950**	1c
				71600	Travel	21,000	14,000	10,800	4,000	2,000	**51,800**	1d
				72100	Contractual services – comp.	20,000	74,000	56,000	20,000		**170,000**	1e
				74200	Publications	1,000	3,000	10,000	1,500	3,000	**18,500**	1f
				74500	Miscellaneous	1,000	900	800	800	750	**4,250**	
				75700	Workshops and meetings	10,000	5,000	5,000	3,000	3,000	**26,000**	1g
				Sub-total GEF		**186,950**	**215,900**	**152,100**	**73,800**	**26,250**	**655,000**	
			UNDP	71200	International Consultants	30,000	50,000				**80,000**	1h
				71300	Local Consultants	10,000	8,000	15,000	11,000	10,000	**54,000**	1i
				72100	Contractual services – comp.	70,000	73,000				**143,000**	1j
				Sun-total UNDP		**110,000**	**131,000**	**15,000**	**11,000**	**10,000**	**277,000**	

	Total Outcome 1					**296,950**	**346,900**	**167,100**	**84,800**	**36,250**	**932,000**	
OUTCOME 2	**UNDP**	**62180**	**SCCF**	71200	International Consultants	85,000	66,000	38,000	16,000		205,000	2a
				71300	Local Consultants	80,000	46,000	38,000	40,000	13,500	217,500	2b
				71400	Contractual services – indiv.	27,500	34,400	34,400	34,400	34,400	165,100	2c
				71600	Travel	16,000	13,000	6,700	4,000	2,700	42,400	2d
				72100	Contractual services – comp.	65,000	60,000	88,000	37,000		250,000	2e
				72800	Equipment software and hardware	70,000	360,000				430,000	2f
				74500	Miscellaneous	1,000	1,000	1,000	1,000	1,000	5,000	
				Sub-total GEF		**344,500**	**580,400**	**206,100**	**132,400**	**51,600**	**1,315,000**	
	Total Outcome 2					**344,500**	**580,400**	**206,100**	**132,400**	**51,600**	**1,315,000**	
OUTCOME 3	**UNDP**	**62180**	**SCCF**	71200	International Consultants	18,000	20,000	31,000	21,000	6,500	96,500	3a
				71300	Local Consultants	8,000	18,000	18,000	16,000	7,500	67,500	3b
				71400	Contractual services – indiv.	41,150	41,150	41,150	41,150	40,650	205,250	3c
				71600	Travel	4,000	4,000	7,000	5,000	4,000	24,000	3d
				72100	Contractual services-comp.			525,000	1,150,000	687,550	2,362,550	3e
				72800	Eq - software		20,000				20,000	3f
				74500	Miscellaneous	500	500	1,200	1,200	800	4,200	
				Sub-total GEF		**71,650**	**103,650**	**623,350**	**1,234,350**	**747,000**	**2,780,000**	
			UNDP	71200	International Consultants	65,000	55,000	32,500			152,500	3g
				71300	Local Consultants	54,000	54,000	54,000	54,000	54,000	270,000	3h
				72100	Contractual services-comp.	71,000	60,000	198,500	235,000	236,000	800,500	3i
				Sub-total UNDP		**190,000**	**169,000**	**285,000**	**289,000**	**290,000**	**1,223,000**	
	Total Outcome 3					**261,650**	**272,650**	**908,350**	**1,523,350**	**1,037,000**	**4,003,000**	

Project Management	**UNDP**	**62180**	**SCCF**	71400	Contractual services – indiv.	32,000	36,470	36,470	36,470	36,350	**177,760**	4a
				71600	Travel	1,850	1,700	1,700	1,700	1,820	**8,770**	4b
				72100	Contractual services – comp.	7,500	4,500	4,000	4,500	4,470	**24,970**	4c
				72200	Equipment	3,000	3,000				**6,000**	4d
				72400	Communication	1,300	1,300	1,300	1,300	1,300	**6,500**	4e
				72500	Office supplies	1,000	1,000	1,000	1,000	1,000	**5,000**	4f
				74100	Professional services	3,000	3,000	3,000	3,000	3,000	**15,000**	4g
				74500	Miscellaneous	1,200	1,200	1,200	1,200	1,200	**6,000**	
				Sub-total GEF		**50,850**	**52,170**	**48,670**	**49,170**	**49,140**	**250,000**	
	Total Project Management					**50,850**	**52,170**	**48,670**	**49,170**	**49,140**	**250,000**	
TOTAL GEF	**UNDP**	**62180**	**SCCF**			**653,950**	**952,120**	**1,030,220**	**1,489,720**	**873,990**	**5,000,000**	
TOTAL UNDP	**UNDP**		**UNDP**			**300,000**	**300,000**	**300,000**	**300,000**	**300,000**	**1,500,000**	
GRAND TOTAL											**6,500,000**	

Summary of Funds: [20]

	Amount Year 1	Amount Year 2	Amount Year 3	Amount Year 4	Amount Year 5	Total
GEF (SCCF)	653,950	952,120	1,030,220	1,489,720	873,990	5,000,000
Donor 2 (cash) - UNDP	300,000	300,000	300,000	300,000	300,000	1,500,000
Donor 2 (in-kind) - UNDP	12,000	12,000	12,000	12,000	12,000	60,000
Donor 3 (cash) - National Government (Sava River Watershed Agency of FBiH)	0	100,000	200,000	200,000	200,000	700,000

[20] Summary table should include all financing of all kinds: GEF financing, cofinancing, cash, in-kind, etc...

Donor 4 (cash) - National Government (Ministry of Agriculture, Forestry and Water Management of RS)	0	1,875,000	13,125,000	15,000,000	45,000,000	75,000,000
TOTAL	965,950	3,239,120	14,667,220	17,001,720	46,385,990	**82,260,000**

Budget Note	Description of cost item
1a	Contracting of international experts: a) Chief technical expert (15 wks@$4000/wk), b) Climate Change expert (7 wks@$3500/wk), c) Lead legal/policy expert (12 wks@$3750/wk) d) Socio- economic expert (4 wks@$4000/wk) e) institutional expert (4 weeks@@$3750/wk) f) monitoring & evaluation experts (10 wks@$3500/wk)
1b	Contracting of local expert: a) legal expert b) socio-economic expert c) hydrologist d) spatial planner e) climate change expert d) institutional expert (total of 70 weeks @ 1500/wk)
1c	Long-term consultants: Project manager 65 weeks@750/wk, Project officer 52 weeks@600/wk
1d	Travel costs of: (i) local consultants inclusive of vehicle costs, fuel and DSA; (ii) international consultants (including M&E experts), inclusive of flights, DSA and internal travel
1e	Procurement of: a) Company to develop flood zones maps in VRB @ 60.000, b) Impact assessment of the new legislation and capacity building roadmap @35.000, c) development of guidance documents @50.000 d) CC modelling @ 25.000
1f	Project visibility documents, Guidance documents, Development control rules and regulations
1g	Inception workshop, inter-agency working group workshops
1h	Contracting of international experts: a) DRR expert (20 wks@$4000/wk)
1i	Contracting of local experts: a) DRR experts (36 wks@$1500/wk)
1j	Procurement of: a) Company to develop DRR platform for BiH @ 143.000
2a	Contracting of international experts: (a) Chief technical expert (16 wks@$4000/wk), (b) hydrologist (7 wks@$3500/wk), (c) hydraulic modeller (7 wks@3500/wk) d) Socio-economic expert (6 wks@$4000/wk), e) institutional expert (6 weeks@@$3750/wk) f) hydrometric expert (8 wks@$3500/wk) g)monitoring & evaluation experts (5 wks@$3500/wk)
2b	Contracting of local expert: a) hydrologist b) hydraulic engineer c) hydraulic structures design engineer d) GIS expert e) hydraulic modeler f) socio-economic expert g) hydrometry expert h) telecommunications expert (total of 145 weeks @ 1500/wk)
2c	Long-term consultants: a) Project manager 65 weeks@750/wk, b) Project officer 52 weeks@600/wk c) Technical officer 131 weeks@ 650/week
2d	Travel costs of: (i) local consultants inclusive of vehicle costs, fuel and DSA; (ii) international consultants, inclusive of flights, DSA and internal travel
2e	Procurement of: a) Company to conduct topographic survey @130 000, b) company to establish Spatial data infrastructure @ 30.000 c) company to develop high resolution vulnerability maps for VRB @ 50.000 d) cost of training for hydrometric specialists, training for practitioners, training on CC induced FRM @ 40.000
2f	Hardware and software for a centralized hydrometric database @60.000, equipment for institutionalization of GIS-based data base @10.000, Procurement of hydrometric monitoring equipment@360.000

3a	Contracting of international experts: (a) Chief technical expert (4 wks@$4000/wk), (b) Economist-flood insurance expert (6 wks@$3500/wk), (c) EWS expert (12 wks@3500/wk) (d) monitoring & evaluation experts (5 wks@$3500/wk)
3b	Contracting of local expert: a) agricultural expert b) socio-economic expert c) telecommunication expert g) hydraulic engineer (total of 45 weeks @ 1500/wk)
3c	Long-term consultants: a) Project manager 52 weeks@750/wk, b) Project officer 133 weeks@600/wk c) Technical officer 133 weeks@ 650/week
3d	Travel costs of: (i) local consultants inclusive of vehicle costs, fuel and DSA; (ii) international consultants, inclusive of flights, DSA and internal travel
3e	Implementation of identified non structural measures
3f	Early warning system
3g	Contracting of international experts: a) DRR legal/policy expert (10 wks@$4000/wk) b) DRR institutional expert (15 wks@$3500/wk) c) Disaster response expert (15 wks@$4000/wk)
3h	Contracting of local experts: a) DRR training experts b) Awareness raising expert c) local level DRR policy development experts d) Disaster response expert (total of 180 wks@$1500/wk)
3i	Small scale disaster mitigation works
4a	Project management team (project manager 80 weeks@650/wk and project assistant 262 weeks@480/wk)
4b	Project management travel costs
4c	Project office and maintenance costs (furniture, utilities, vehicle maintenance etc)
4d	IT equipment
4e	Project communication cost
4f	Project supplies costs
4g	Audit

WORKPLAN

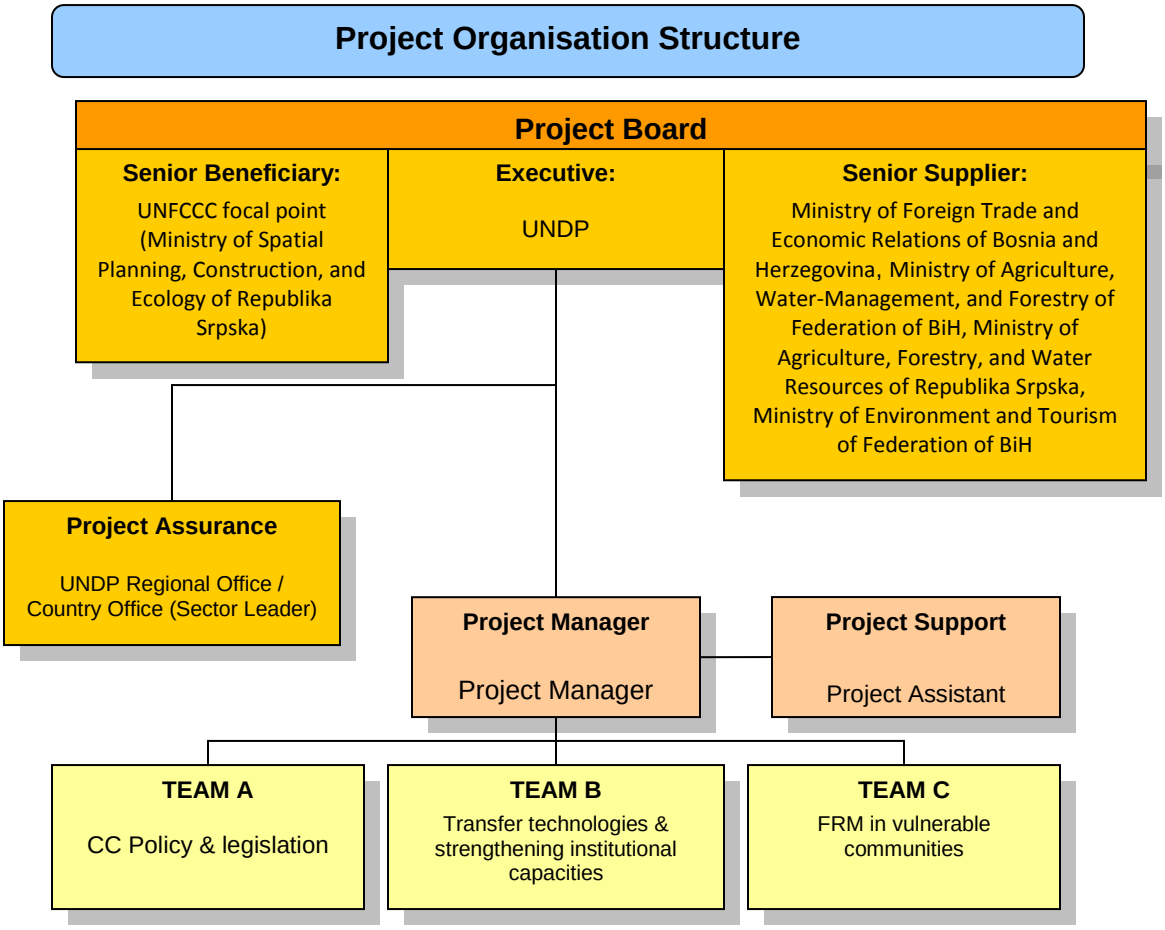
		Year 1				Year 2				Year 3				Year 4				Year 5			
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
Outcome 1 - Key relevant development strategies/policies/legislation integrate climate change-resilient flood management approaches																					
1.1. At least two priority sectoral policies and plans (e.g. agriculture, hydropower, water resources) updated to include climate change modeling results	1.1.1. Update and extend the review of legislation, policies strategies and plans and Identify entry points in the policies and plans for introducing Climate Change considerations within the energy (related to HPP dams) and agriculture sectors.																				
	1.1.2. Establish an inter-agency working group to elaborate current practice and deficiencies with respect to FRM and include climate change considerations.																				
	1.1.3. Undertake detailed technical studies (including modelling) on CC impacts on the identified sectors (energy and agriculture)																				
	1.1.4. Develop and codify detailed methodologies for incorporating CC modelling results into risk assessments, strategies, policies and plans for the energy and agriculture sectors																				
	1.1.5. Develop and finalise robust sector policies frameworks and guidelines to incorporate climate change																				
1.2 Floodplain mang't and spatial planning regulations and policies updated to include CC risks	1.2.1. Undertake detailed review of existing spatial planning legislation and policies and policies for zoning development and economic activities.																				
	1.2.2. Develop a flood zone designation policy, and outline the permitted land uses in each zone																				
	1.2.3. Develop policies that will protect against the impacts of flood risk.																				
	1.2.4. Establish and publish development zoning control rules and regulations.																				
	1.2.5. Develop and implement a capacity building roadmap for state and entity authorities to integrate new policies, plans and strategies into spatial planning																				
	1.2.6. Undertake an impact assessment of the proposed new legislation and policy to determine and quantify effects																				
1.3 Adaptation technology solutions for CR-FRM codified and disseminated	1.3.1. Produce an article and footage every year to showcase																				
	1.3.2. Produce technical and non-technical guidance documents for all studies and assessments undertaken as part of the project																				
Component 2 - Climate resilient flood risk management is enabled by transferring modern technologies and strengthening institutional capacities																					
2.1 Improved models incorporating CC predictions, to produce flood hazard maps	2.1.1. Establish a project Spatial Data Infrastructure																				
	2.1.2. Digitize, save and systematize/structure historical hydrometeorological observations, measurements and other data and link them to GIS systems																				
	2.1.3. Establishment of a centralised hydrometric database																				
	2.1.4. Undertake detailed topographic surveys																				

	2.1.5. Establish numerical hydrological and hydraulic models of the Vrbas basin based on detailed surveys of the physical characteristics of the river basin, and produce high resolution flood hazard inundation maps																					
	2.1.6. Provide training in hydrological and hydraulic modelling to practitioners																					
2.2 GIS-based vulnerability, loss and damages assessment tool and database established and institutionalized	2.2.1. Develop and codify methods and tools for undertaking socio-economic surveys																					
	2.2.2. Undertake socio-economic and vulnerability assessment in the VRB																					
	2.2.3. Engage and involve the community in the development of climate resilient adaptive measures that will meet their needs.																					
	2.2.4. Develop a GIS-based tool to integrate various spatial socio-economic data with the flood hazard maps, produce vulnerability maps																					
	2.2.5. Develop tools, methods, guidelines and procedures for recording flood events, undertaking post-event surveys and assessing vulnerability to flooding as well as assessing the effectiveness of flood mitigation measures in reducing vulnerability and damages.																					
2.3 Hydro-meteorological monitoring system in the VRB upgraded and harmonized into a central hydrometric system;	2.3.1. Review the existing coverage, physical condition and data collection procedure including the quality of data.																					
	2.3.2. Undertake an assessment of the monitoring network requirements for effective monitoring for strategic flood risk management, flood forecasting and early warning.																					
	2.3.3 Provide technical and financial assistance to improve hydrometric monitoring network																					
	2.3.4. Purchase and implement a centralised hydrometric database for Vrbas basin (and centralised hydrometric network)																					
	2.3.5. Digitise all paper format data for VRB and systematise and store within the new hydrometric database.																					
	2.3.6. Assess the institutional arrangements for the operation and maintenance of the hydromet stations and suggest manpower and financial requirements, and training needs, for the efficient O&M of all the stations.																					
	2.3.7. Prepare an operational plan for the hydrometric network																					
	2.3.8. Provide detailed specification and design including costs of all equipment and each component of the hydrometric network																					
	2.3.9. Provide training for hydrometric staff in the O&M of up-graded hydrometric stations																					
2.4 Institutional capacity strengthening plan developed and targeted training on CR-FRM provided to at least 100 practitioners	2.4.1. Undertake an assessment of state, entity and local capability and develop an institutional capacity building plan																					
	2.4.2. Add climate risk management and flood risk management sessions to the trainings provided by the existing DRR project																					
	2.4.3. Introduce advanced tools and methods in FRM																					
	2.4.4. Examine the feasibility of establishing a University MSc. course in CR-FRM at local University.																					

and decision-makers;	2.4.5. Develop training plans for each technical area of expertise related to climate-induced flood risk assessment and management																					
	2.4.6. Provide training during the project in identified fields.																					
Component 3 - New technologies and approaches for enhanced flood risk management applied to increase resilience of vulnerable communities in VRB																						
3.1 Integrated land use and flood risk management plan for the VRB developed and non-structural measures implemented by local communities, government and/or private sector	3.1.1. Undertake a farm-level exposure and flood risk assessment for all agricultural land																					
	3.1.2. Assess and identify flood risks to agricultural infrastructure, as well as flood risk management opportunities																					
	3.1.3. Provide farm level training in more flood-resilient agricultural methods.																					
	3.1.4. Asses the floodplain agro-forestry potential of the VRB																					
	3.1.5. Undertake feasibility studies into an index-based flood insurance scheme for VRB and design and implement pilot Index-flood insurance scheme in 13 municipalities.																					
	3.1.6. Develop a bottom-up, multi-stakeholder, consensus-based FRM plan for Vrbas Basin.																					
	3.1.7. Develop long list of structural and non-structural options																					
	3.1.8. Develop short list of options.																					
	3.1.9. Assess options																					
	3.1.10. Develop outline capital costs of the options																					
	3.1.11. Obtain feedback from the stakeholder consultation processes to refine the preferred option(s) and re-assess the technical and socio-economic performance of the option(s).																					
	3.1.12. Feasibility and design of the preferred options																					
	3.1.13. Carry out cost and quantity estimates of each finalized non-structural option																					
	3.1.14. Detailed design of non-structural measures																					
	3.1.15. Implement non-structural measures																					
3.2 Participatory community-based adaptation strategies, technologies and practices implemented in priority flood risk areas	3.2.1. Undertake extensive socio-economic surveys																					
	3.2.2. Identify and review existing community-based programs and identify entry points into existing community-based schemes																					
	3.2.3. Establish Participatory Geographical Information Systems (PGIS) approach																					
	3.2.4. Develop and implement Community engagement, mobilization and sensitization plans.																					
	3.2.5. Develop and implement Community Communications strategy for FFEWS.																					
	3.2.6. Develop and implement Community-specific Intervention plans with participation of the local communities.																					
	3.2.7. Mobilise communities in the implementation in intervention plans																					

3.3 Local communities trained to implement and maintain flood resilient non-structural intervention measures	3.3.1. Provide training to employees in each municipality on maintenance of non-structural intervention measures.																						
	3.3.2. Provide training in the operation of EWS in the 3 pilot basins																						
	3.3.3. Provide training for communities within the 13 municipalities, on roles and responsibilities during flood emergency procedures.																						
	3.3.4. Provide training for first and second responders for flood emergencies – including drills and role play exercises.																						
3.4 Early warning system in VRB modified to include the new hydrometric monitoring network as part of a fully-integrated flood forecasting system, and Municipal-level flood response and preparedness plans prepared and implemented.	3.4.1. Development of the ToR for a full FFEWS for VRB																						
	3.4.2. Review any existing flood forecasting programmes, or elements of FFEWS in BiH.																						
	3.4.3. Assess current institutional arrangements and capacity for flood forecasting, flood emergency response and develop an institutional Arrangement plan for FFEWS.																						
	3.4.4.Undertake telecommunications studies																						
	3.4.5. Identify the requirement for flood forecasting model(s)																						
	3.4.6. Design and implementation of fully-integrated FFEWS.																						
	3.4.7. Establishment of community-based Early Warning systems for VRB.																						
	3.4.8. Onduct community surveys to identify optimum locations for community based schemes.																						
	3.4.9. Design of community-based schemes in consultation with local community.																						
	3.4.10. Consultation with communities on proposed schemes.																						
	3.4.11. Detailed Specification of equipment required for community-based EWS for 3 pilot sub-basins																						
	3.4.12. Purchase of equipment to be installed																						
	3.4.13. Installation of monitoring equipment																						
	3.4.14. Training for community EWS operators and practitioners on community-based EWS																						
	3.4.15. Final Implementation of the community-based EWS																						
	3.4.16. Design of a public-facing website to disseminate early warning information to the public																						
	3.4.17. Early warning awareness and training workshops for community, NGOs, government and media representatives.																						
	3.4.18. Produce guidance for the development of a flood forecasting and early warning system																						
	3.4.19. Municipal-level flood response and preparedness plans prepared and implemented																						

5. Management Arrangements



208. Given the complexity of BiH's federal administrative set-up, that includes two self-governing entities and applies multi-layered administrative procedures, the recently approved one United Nations Programme / United Nation Development Assistance Framework (UNDAF) for 2015 – 2019 and UNDP's Country Programme Document (CPD) for 2015 – 2019 for Bosnia and Herzegovina stipulate that all GEF and other vertical funds' financed projects be implemented under the direct implementation modality (DIM). Furthermore, this modality has been supported and agreed by governments at all levels (state and entity) and is in line with the Standard Basic Assistance Agreement (SBAA, 1995) between the UNDP and the Government of BiH. Guided by these above mentioned country programme frameworks, the DIM will be applied in a way to take into account potentials for maximum cost-effectiveness and tailored capacity development of counterpart government institutions.

209. Bosnia and Hercegovina UNFCCC Focal Point, Ministry of Spatial Planning, Construction and Ecology of Republic of Srpska and Ministry of Foreign Trade and Economic Relations (MoFTER) are the government institutions which will be engaged in the implementation of the project and will act as the Responsible Parties engaged by UNDP. UNDP is the Executing Entity/Implementing Partner for the project and is accountable to the GEF for the use of the funds. The UNDP Programme officer will take the oversight and quality assurance role for UNDP while a Project Manager contracted for the project will have the project execution/implementation role and thus separating project oversight and execution/implementation duties. Project implementation by the ministries engaged as Responsible Parties will ensure the timely and verifiable attainment of the project objective and outcomes. The

UNFCCC Focal point and MoFTER will provide support to, and inputs for, the implementation of all project activities.

210. Working closely with both ministries, UNDP will be responsible for: (i) providing project assurance services to government (ii) recruitment of project staff and contracting of consultants and service providers; (iii) overseeing financial expenditures against project budgets; and (iv)ensuring that all activities including procurement and financial services are carried out in strict compliance with UNDP/GEF procedures. A UNDP Project Manager will be assigned with the responsibility for the day-to-day management and control over project finance.

211. The UNDP country office shall provide support services for the Project as: (i) HR activities including recruitment of project personnel, issuance of project personnel contracts etc; (ii) process of undertaking procurement activities of project goods and services; (iii) finance transactions; etc .

212. A Project Board will be established at the inception of the project to monitor project progress, to guide project implementation and to support the project in achieving its listed outputs and outcomes. It will be co-chaired by UNDP and BiH UNFCCC focal point. Project implementing entities (Ministry of Spatial Planning, Construction, and Ecology of Republika Srpska, Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina), as the key governmental institutions in charge of spatial planning, natural resources management, environmental protection and climate change policies, will ensure that other governmental agencies are duly consulted and involved as per their mandate. Ministry of Agriculture, Water-Management, and Forestry of Federation of BiH, Ministry of Agriculture, Forestry, and Water Resources of Republika Srpska, Ministry of Environment and Tourism of Federation of BiH will also be active members of the Project Board.

213. Other participants can be invited into the Board meetings at the decision of the Board. The Board will meet regularly (at least twice a year) to review project progress, discuss and agree on project work plans. One of the key tasks of the Board will be to ensure coordination and synchronization of central and local-level activities supported by the project. In this respect, the Board will serve as a platform for key project stakeholders and beneficiaries to regularly get together and design a joint strategy of work on the project.

214. The final list of the Project Board members will be completed at the outset of project operations and presented in the Inception Report by taking into account the envisaged role[21] of different parties in the Board. The Project Manager will participate as a non-voting member in the Board meetings and will also be responsible for compiling a summary report of the discussions and conclusions of each meeting.

215. The day-to-day management of the project will be carried out by a Project Manager under the overall guidance of the Project Board. The core Project Team will consist of a Project Manager and Administrative Assistant, supported by Senior/Chief Technical Advisor and Project Officer who will divide their responsibilities among specified three main areas of work. For successfully doing this, public outreach, establishment of the contacts and co-operation with the key local and international stakeholders and expert institutions as well as ability for adaptive management and new innovative approaches will be of utmost importance and will be emphasized in the recruitment. The Project Manager will report to UNDP and the Project Board. The Terms of Reference of the key project personnel are presented in the Annex 7 of this Project Document. The project personnel will be selected on a competitive basis in accordance with the relevant UNDP rules and procedures and in consultation with the UNDP-GEF Regional Technical Adviser.

216. At the outset of project operations, a project inception report will be prepared in co-operation with the key stakeholders, local and international expert(s) engaged in leading or supporting the implementation of the project. The inception report will include detailed work plans for each subcomponent (output) of the project at the specific activity level and elaboration of the required resources and stakeholders to be involved for reaching the stated targets. These output specific work plans will provide the main basis for day-to-day management, implementation and monitoring of the

[21] **Senior Supplier**: individual or group representing the interests of the parties concerned which provide funding for specific cost sharing projects and/or technical expertise to the project. **Senior Beneficiary**: individual or group of individuals representing the interests of those who will ultimately benefit from the project.

progress of the project, complemented by the annual monitoring to be done at the Outcome level by the PIRs. For further details about the project's overall monitoring and evaluation framework, see chapter 6.

217. The UNDP Country Office in Bosnia and Herzegovina offers the following dedicated staff capacity for project implementation support in the area of environment and energy: (i) Energy and Environment Sector Leader who oversees programme implementation on a daily basis, including quality assurance and monitoring and evaluation; (ii) Programme Support Officer - reviews the budgets and monitors project delivery status; (iii) Head of Operations Unit - assures compliance with overall fiduciary standards of UNDP; (iv) UNDP Resident Representative, who liaise at high-level with the Government and will negotiate key policy changes proposed by the project.

218. UNDP Bosnia and Herzegovina will maintain the oversight and management of the overall project budget. It will be responsible for monitoring project implementation, timely reporting of the progress to the UNDP Regional Co-ordination Center and the GEF as well as organizing mandatory and possible complementary reviews and evaluations on an as-needed basis. It will also be responsible for procurement of the required expert services and other project inputs and administer the required contracts. Furthermore, it will support the co-ordination and networking with other related initiatives and institutions in the country.

219. For successfully reaching the objective and outcomes of the project, it is essential that the progress of different project components will be closely monitored both by the key local stakeholders and authorities as well as by project's international experts, starting with the finalization of the detailed, component-specific work plans and implementation arrangements and continuing through the project's implementation phase. The purpose of this is to facilitate early identification of possible risks to successful completion of the project together with adaptive management and early corrective action, when needed.

220. In order to accord proper acknowledgement to GEF for providing funding, a GEF logo should appear on all relevant GEF project publications, including any hardware purchased with GEF funds. Any citation on publications regarding projects funded by GEF should also accord proper acknowledgement to GEF in accordance with the respective GEF guidelines.

6. Monitoring Framework and Evaluation

221. The following general text is to be used in the project document though it should be amended to suit the specific requirements of the project and best practice in various RCUs. UNDP corporate tools are to be used in project monitoring and evaluation:

1. IRRF (previously ERBM) which is linked to ATLAS
2. UNDP Evaluation Resource Centre

222. The project will be monitored through the following M& E activities. The M& E budget is provided in the table below.

M&E work plan and budget:

Type of M&E activity	Responsible Parties	Budget US$ Excluding project team staff time	Time frame
Inception Workshop and Report	▪ Project Manager ▪ UNDP CO, UNDP CCA	Indicative cost: 10,000	Within first two months of project start up
Measurement of Means of Verification of project results.	▪ UNDP CCA RTA/Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members.	To be finalized in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of	▪ Oversight by Project Manager	To be determined as part of	Annually prior to

Type of M&E activity	Responsible Parties	Budget US$ Excluding project team staff time	Time frame
Means of Verification for Project Progress on output and implementation	▪ Project team	the Annual Work Plan's preparation.	ARR/PIR and to the definition of annual work plans
ARR/PIR	▪ Project manager and team ▪ UNDP CO ▪ UNDP RTA ▪ UNDP EEG	None	Annually
Periodic status/ progress reports	▪ Project manager and team	None	Quarterly
Mid-term Evaluation	▪ Project manager and team ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost: 40,000	At the mid-point of project implementation.
Final Evaluation	▪ Project manager and team, ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost : 40,000	At least three months before the end of project implementation
Project Terminal Report	▪ Project manager and team ▪ UNDP CO ▪ local consultant	0	At least three months before the end of the project
Audit	▪ UNDP CO ▪ Project manager and team	Indicative cost per year: 3,000	Yearly
Visits to field sites	▪ UNDP CO ▪ UNDP RCU (as appropriate) ▪ Government representatives	For GEF supported projects, paid from IA fees and operational budget	Yearly
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		**US$ 105,000**	

Project start:

223. A Project Inception Workshop will be held within the first 2 months of project start with those with assigned roles in the project organization structure, UNDP country office and where appropriate/feasible regional technical policy and programme advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan.

224. The Inception Workshop should address a number of key issues including:

a) Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of UNDP CO and RCU staff vis à vis the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.
b) Based on the project results framework and the relevant SOF (e.g. GEF) Tracking Tool if appropriate, finalize the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.
c) Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed and scheduled.
d) Discuss financial reporting procedures and obligations, and arrangements for annual audit.

e) Plan and schedule Project Board meetings. Roles and responsibilities of all project organisation structures should be clarified and meetings planned. The first Project Board meeting should be held within the first 12 months following the inception workshop.

225. An Inception Workshop report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

226. Quarterly:

- Progress made shall be monitored in the UNDP Enhanced Results Based Managment Platform.
- Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS. Risks become critical when the impact and probability are high. Note that for UNDP GEF projects, all financial risks associated with financial instruments such as revolving funds, microfinance schemes, or capitalization of ESCOs are automatically classified as critical on the basis of their innovative nature (high impact and uncertainty due to no previous experience justifies classification as critical).
- Based on the information recorded in Atlas, a Project Progress Reports (PPR) can be generated in the Executive Snapshot.
- Other ATLAS logs can be used to monitor issues, lessons learned etc... The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

227. Annually:

- Annual Project Review/Project Implementation Reports (APR/PIR): This key report is prepared to monitor progress made since project start and in particular for the previous reporting period (30 June to 1 July). The APR/PIR combines both UNDP and SOF (e.g. GEF) reporting requirements.

  The APR/PIR includes, but is not limited to, reporting on the following:
  - Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative)
  - Project outputs delivered per project outcome (annual).
  - Lesson learned/good practice.
  - AWP and other expenditure reports
  - Risk and adaptive management
  - ATLAS QPR
  - Portfolio level indicators (i.e. GEF focal area tracking tools) are used by most focal areas on an annual basis as well.

Periodic Monitoring through site visits:

228. UNDP CO and the UNDP RCU will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report/BTOR will be prepared by the CO and UNDP RCU and will be circulated no less than one month after the visit to the project team and Project Board members.

Mid-term of project cycle:

229. The project will undergo an independent Mid-Term Evaluation at the mid-point of project implementation (insert date). The Mid-Term Evaluation will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half

of the project's term. The organization, terms of reference and timing of the mid-term evaluation will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-term evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-EEG. The management response and the evaluation will be uploaded to UNDP corporate systems, in particular the UNDP Evaluation Office Evaluation Resource Center (ERC).

230. The relevant SOF (GEF) Focal Area Tracking Tools will also be completed during the mid-term evaluation cycle.

End of Project:

231. An independent Final Terminal Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNDP and SOF (e.g. GEF) guidance. The final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term evaluation, if any such correction took place). The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-EEG.

232. The Final Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded to PIMS and to the UNDP Evaluation Office Evaluation Resource Center (ERC).

233. The relevant SOF (e.g GEF) Focal Area Tracking Tools will also be completed during the final evaluation.

234. During the last three months, the project team will prepare the Project Terminal Report. This comprehensive report will summarize the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

Learning and knowledge sharing:

235. Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums.

236. The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons learned. The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects.

237. Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

Communications and visibility requirements:

238. Full compliance is required with UNDP's Branding Guidelines. These can be accessed at http://intra.undp.org/coa/branding.shtml, and specific guidelines on UNDP logo use can be accessed at: http://intra.undp.org/branding/useOfLogo.html. Amongst other things, these guidelines describe when and how the UNDP logo needs to be used, as well as how the logos of donors to UNDP projects needs to be used. For the avoidance of any doubt, when logo use is required, the UNDP logo needs to be used alongside the GEF logo. The GEF logo can be accessed at: http://www.thegef.org/gef/GEF_logo. The UNDP logo can be accessed at http://intra.undp.org/coa/branding.shtml.

239. Full compliance is also required with the GEF's Communication and Visibility Guidelines (the "GEF Guidelines"). The GEF Guidelines can be accessed at: http://www.thegef.org/gef/sites/thegef.org/files/documents/C.40.08_Branding_the_GEF%20final_0.pdf.

Amongst other things, the GEF Guidelines describe when and how the GEF logo needs to be used in project publications, vehicles, supplies and other project equipment. The GEF Guidelines also describe other GEF promotional requirements regarding press releases, press conferences, press visits, visits by Government officials, productions and other promotional items.

240. Where other agencies and project partners have provided support through co-financing, their branding policies and requirements should be similarly applied.

7. Legal Context

241. Standard text has been inserted in the template. It should be noted that although there is no specific statement on the responsibility for the safety and security of the executing agency in the Standard Basic Assistance Agreement (SBAA) and the supplemental provisions, the second paragraph of the inserted text should read in line with the statement as specified in SBAA and the supplemental provision, i.e. "the Parties may agree that an Executing Agency shall assume primary responsibility for execution of a project."

242. This document together with the CPAP signed by the Government and UNDP which is incorporated by reference constitute together a Project Document as referred to in the SBAA [or other appropriate governing agreement] and all CPAP provisions apply to this document.

243. Consistent with the Article III of the Standard Basic Assistance Agreement, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP's property in the implementing partner's custody, rests with the implementing partner.

244. The implementing partner shall:

a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;

b) assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

245. UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

246. The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

Audit Clause

247. The Audit will be conducted in accordance with UNDP Financial Regulations and Rules and applicable audit policies on UNDP projects.

8. Annexes

Annex 1. Risks and Assumptions

Risk Description/Risk Source	Consequence	Risk Prioritisation	Mitigation/Action Description
Key roles within the project not filled. Lack of expertise for key role.	Impact on project quality and possible programme/cost impacts.	M	Ensure a good fit between the objectives of a role and the experience of the person allocated to that role.
Underestimation of project scope and requirements	Additional time and cost for undertake the project	M	Allow sufficient time for good project planning and risk management
Poor communications between international experts and local experts	Misunderstandings/difficulty in collaborating on technical work. Difficulty in quality assurance due to language/understanding barriers	M	Since the project deliverables will be delivered in English, need to ensure sufficient translators with appropriate technical background to enable effective communications. While the project reporting will be in English, it is imperative that the outputs are also translated back into technically correct local language to ensure that key messages and ideas are not 'Lost in Translation'
Poor user requirements specified, poorly defined data standards leading to poor design and implementation of data management system	Poor data management leading to errors in technical assessment and errors in design.	M	Scope project data management requirements early on. Establish facilities (i.e. technologies) that enable effective data sharing between organisation/individuals holder and/or accessing data. Identify 'data champions' within organisations involved in project implementation of supply of data
Failure to identify key data sets. Delays in collecting essential data for the project. Risk of essential data not being available or to the quality or accuracy needed	Lack of data leading to poor technical assessment and design. If essential data sets not available (or of poor quality) may need to undertake data modelling (e.g. data infilling), or collect data as part of the project	M	Undertake detailed data requirements and data identification (identifying all sources) as the first priority on the project. Link to data management definition task to ensure early centralised access of all relevant data. Undertake data analysis to identify quality, gaps, requirement for data modelling and additional data collection early on
Cost of modelling software more than budgeted for. Cost of floodplain DEM greater than original estimate. Floodplain data too coarse for detailed modelling	Higher expenditure on software and DEM data. If poor resolution DEM data used, could result in poor modelling results and poor design of intervention measures	M	Obtain detailed software quotes and ensure it fits within budget. Review freeware but justify using freeware from a technical perspective. During inception phase undertake a 'user requirements gathering' exercise to include a review of existing and proposed software

			needs and draw from lessons learned from projects such as SEEC CRIF, with regards to software cost. Before purchasing DEM obtain sample data for different parts of the VRB basin and check accuracy. Undertake ground truthing to confirm data accuracy
Cost of survey equipment higher than estimated	Higher expenditure	M	Investigate alternatives to purchasing surveying equipment under this project. For example examine the cost effectiveness of hiring a survey contractor who will already have the equipment rather than purchasing
Scope and cost of survey underestimated	Insufficient survey data for technical studies. Higher expenditure to get the surveys required	M	Early scoping and recosting of surveys to be undertaken
Delays in availability of historical data, survey data leading to delays in starting the technical studies and modelling. Insufficient data and/or data of poor quality available to undertake sufficiently detailed and accurate modelling to support feasibility and desing studies; Model not suitably detailed and accurate to undertake feasibility studies	Delay to overall programme, poor outputs from technical assessments leading to poor intervention designs	M	Enforce data collection and survey programme rigorously. Identify data quality issues early as well as issues with model and technical studies quality before using in intervention designs. Enforce a 'check, review, authorise' procedure to capture quality issues related to human errors
Failure to consult all relevant stakeholders	Leading to lack of by-in and failure to agree policy and legislative changes	L	Undertake institutional mapping to identify all relevant stakeholders in government, non-government, community donor and other user groups. Early establishment of inter-agency working group and engagement with key stakeholders. Ensure continued engagement of stakeholders throughout the process
Failure to reach agreement on new policy frameworks	Limited (or no) changes to legislation to address current issues will lead to continued exposure to hydrometeorological hazards	H	Ensure that the Inter-agency Working Group includes the right composition of stakeholders and is all inclusive to maximise the chance of reaching agreement on new policy framework. Ensure that the Project Board is also inclusive of all key stakeholders.

Failure to fully identify training needs	Continued lack of capacity within BiH for hydrometeorological hazard assessment and management. Leading to continued vulnerability	L	Initial and continued assessment of capacity and establishment of training programme that will ensure continued development of capability and adequate succession planning
Review of requirements and development of a detailed functional specification could result in larger scope for FFEWS than currently budgeted for	Greater cost of establishing FFEWS than previously estimated. Equipment cost increase	M	Review should justify any major changes to the scope and equipment requirement
Unforeseen delays in undertaking essential surveys due to weather/access issues etc.	Delay to overall programme	High	Surveys to be scheduled to maximise favourable weather conditions. Early reconnaissance visits to remote areas will determine potential access difficulties. Issues/Risks will be raised to the PEB and adequate mitigation measures will be discussed/approved by PEB and implemented.
Adverse climatic conditions may also pose risks to workforce health and safety, or damage adaptation measures being implemented		High	The project will draw up an engineering and safety plan to reduce immediate risks of hazard occurrence during works. Health and safety precautions for the workforce will be established in the inception phase, drawing on lessons from other high altitude projects. Contingency and evacuation plans will be prepared.. All sub-contracted firms will need to have H&S insurance for its employees.
Resistance of certain government institutions to introduce floodplain development policy that sets number of land use limiting regulations and floodplain zoning rules.		Medium	Bottom-up approach to the policy development with active engagement of local population and authorities will enable the project to follow the principles of subsidiarily and participation underlined in the Regional Development Strategy and help local authorities make decentralised climate compatible development decisions. Engagement of the Regional Development Ministry will help the flood plain policy to emerge in full consistency with the development priorities that will be supported to embark on climate resilient pathway.

Lack of incentives for particular local communities to cooperate in activities that do not yield immediate financial value, but aim at longer-term resilience, may reduce stakeholder engagement and comprehensive participation.		Medium	The project incorporates activities that yield immediate benefits for communities in terms of awareness, preparedness, skill development and income generation (agro-forestry schemes). This will be emphasized during all meetings and consultations with community representatives during the inception phase
Due to staff turnover at the target Ministries the trained staff may leave for the other job opportunities undermining installed technical capacity		Low	Special training conditions and / or training for trainers will be arranged to keep the trained staff at the target Ministries. Staff retention and succession plans will be developed
Delays in recruitment of qualified project staff may affect the timeframe of different project activities.		Low	A pro-active coordination mechanism will be established by UNDP during the project inception phase. TORs for project staff have already been prepared
Changes in the governmnet structures and functions		Low	Closely monitor situation and keep regularly updated on any developments in this regards; call immediately PEB meeting.

Annex 2. Letters of co-financing

РЕПУБЛИКА СРПСКА
ВЛАДА
МИНИСТАРСТВО ПОЉОПРИВРЕДЕ, ШУМАРСТВА И ВОДОПРИВРЕДЕ
Трг Републике Српске 1, Бања Лука, тел:051/338-415, факс: 051/338-865, 338-866, E-mail:mps.@mps.vladars.net

Број: 12.07-337-278/14
Датум: 13.06.2014. године

United Nations Development Programme
Energy and Environment Sector

Предмет: Писмо подршке имплементацији пројекта „Интегрисање климатских промјена у смањење ризика од поплава у сливу Врбаса"

Поштовани господине Афанасиев,

Министарство Пољопривреде, шумарства и водопривреде Републике Српске је задужено да у име Владе Републике Српске руководи имплементацију средстава у оквиру пројекта хитне помоћи и заштите од поплава. Средства за ове активности су осигурана од стране Европске инвестиционе банке (EIB) у вриједности од 55 милиона Еура (цца 75 милиона USD). У оквиру активности планирано је да се припреми документација везана за управљање ризицима од поплава те да се инвестирају средства у приоритетне инфраструктурне радове, укључујући и регулацију корита ријека и изградњу насипа.

Предложене активности у оквиру пројекта Интегрисање климатских промјена у смањење ризика од поплава у сливу Врбаса (*Technology transfer for climate resilient flood management in Vrbas River Basin)*) су изузетно релеванте и важне за цјелокупни процес управљања ризиком од поплава у Републици Српској и Босни и Херцеговини, посебно имајући у виду да ће овај пројекат да интегрише и климатске промјене у цјелокупно управљање ризиком од поплава.

С тим у вези овом приликом желимо да искажемо своју пуну подршку предложеном пројекту и да потврдимо да ће планиране активности бити у корелацији са активности које се проводе у оквиру имплементације EIB кредита у циљу креирања синергије инвестиција на терену, и могу сматрати кофинансирањем. Још једном наглашавамо важност предложених активности и надамо се успјешној сарадњи у будућности.

Достављено:
1. Наслов
2. а/а

МИНИСТАР
проф. др Стево Мирјанић

(Coat of arms)

REPUBLIC OF SRPSKA
THE GOVERNMENT

MINISTRY OF AGRICULTURE, FORESTRY AND WATER MANAGEMENT

Square of Republic of Srpska 1, Banja Luka, tel: 051/338-865, 338-866, E-mail: mps.@mps.vladars.net

Number: 12.07-337-278/14
Date: 13th of July, 2014

United Nations Development Programme
Energy and Environment Sector

Subject: Letter of support for implementation of project "Technology transfer for climate resilient flood management in Vrbas River Basin"

Dear Mr. Afanasiev,

On behalf of Government of Republic of Srpska, the Ministry of Agriculture, Forestry and Water Management of Republic of Srpska is in charge to manage implementation of funds within the project for urgent support and flood protection. Funds for these activities are ensured by European Investment Bank (EIB) with total value of 55mil Euros (cca 75mil$). Within the activities it is planned to prepare documentation related to flood risk management, and investment in priority infrastructural works, including regulation of riverbeds and construction of dykes.

Proposed activities within the project Climate Change Integration in Flood risk Reduction in Vrbas River Basin (Technology transfer for climate resilient flood management in Vrbas River Basin) are extremely relevant and important for overall process of flood risk management in Republic of Srpska and Bosnia and Herzegovina, especially, considering that this project will integrate climate changes and overall flood risk management.

Related to this opportunity we would like to express our full support to the proposed project and to confirm that planned activities will correlate with activities implemented within the EIB loan implementation, with the goal of establishment of investments synergy in field, and can be considered as co financing. Once more we stress importance of proposed activities and hope for successful cooperation in the future.

Submitted:

1. Title
2. a/a

(Seal)

MINISTER
(Signature)
Prof.Dr Stevo Mirjanic

"AGENCIJA ZA VODNO PODRUČJE RIJEKE SAVE"
SARAJEVO

"SAVA RIVER WATERSHED AGENCY"
SARAJEVO

Adresa: **Ul. Hamdije Čemerlića 39 a**
71000 Sarajevo
http://www.voda.ba

tel. +387 33 726 400
fax. +387 33 726 423
e – mail: info@voda.ba

UNDP BiH
UN House, Zmaja od Bosne bb
71000 Sarajevo

Naš znak/Our ref.: **10-608-2/14**

Vaš znak/Your ref.:

Datum /Date, Sarajevo, 19.06.2014.

PREDMET: Pismo podrške implementaciji projekta Integrisanje klimatskih promjena u smanjenje rizika od poplava u slivu Vrbasa (Technology transfer for climate resilient flood management in Vrbas River Basin)

Poštovani gospodine Afanasiev,

Zakonom o vodama Federacije BiH "Agencija za vodno područje rijeke Save" Sarajevo je zadužena za provođenje zadataka upravljanja vodama koji se ovim Zakonom i propisima donesenim na osnovu ovog Zakona stavljaju u njihovu nadležnost. Jedan od važnih zadataka Agencije je i osiguranje zaštite od štetnog djelovanja voda. Tokom 2010. Agencija je započela aktivnosti na implementaciji Direktive 2007/60/EC o procjeni i upravljanju poplavnim rizikom. Ova Direktiva od država članica (ali i od zemalja u procesu pristupanja i pretpristupnih zemalja) zahtijeva da procijene da li su svi vodotoci i obalne linije u opasnosti od poplava, da mapiraju obim poplava te imovinu i ljude koji su u opasnosti u ovim područjima, te da preduzmu adekvatne i koordinirane mjere za smanjenje rizika od poplava. U skladu s tim, Agencija je poduzela niz mjera uključujući i preliminarnu procjenu poplavnih rizika na slivovima i povezanih priobalnim zonama i utvrđivanje područja u kojima postoji potencijalno značajan rizik od poplava; izradu mapa opasnosti od poplava i mapa poplavnog rizika za područja u kojima postoje realni rizici od poplavnih šteta; te planove upravljanja poplavnim rizikom za ove zone.

U navedene aktivnosti koje se odnose na implementaciju Direktive o procjeni i upravljanju poplavnim rizikom Agencija je do sada, odnosno do kraja 2014. godine će realizovati sredstva u ukupnoj visini od oko 600.000,00 KM. U narednom periodu je planiran završetak aktivnosti na izradi mapa opasnosti i mapa rizika od poplava. Na osnovu proizašlih rezultata projekta planirana je realizacija radova na uređenju vodotoka kako u FBiH tako i u slivu Vrbasa. U narednih 5 godina za pomenute aktivnosti u slivu Vrbasa planiraju se sredstva u iznosu cca 1.000.000,00 KM.

Obzirom na ograničene resurse, kako ljudske, tako i finansijske svaka pomoć u zajedničkom djelovanju na relizaciji problematike zaštite od voda je dobrodošla. S tim u vezi, želimo da potvrdimo da je projekat Integrisanje klimatskih promjena u smanjenje rizika od poplava u slivu Vrbasa od posebne važnosti za Bosnu i Hercegovinu, posebno iz razloga što će u velikoj mjeri poboljšati sistem upravljanja poplavnim rizikom na slivu rijeke Vrbas. Rezultati ovog projekta će u velikoj mjeri koristiti i za ostale slivove u zemlji, posebno imajući u vidu integrisanje klimatskih scenarija u proračune. Isto tako, zajedničkim radom na ovom projektu će se izgraditi i dodatni ljudski kapaciteti za dalje aktivnosti u ovoj oblasti u Bosni i Hercegovini. Stoga želimo da podržimo ovaj projekat i nadamo se uspješnoj suradnji.

S poštovanjem,

DIREKTOR

Sejad Delić, dipl.inž.

Dostaviti:
- Naslovu,
- Sektor 10,
- a/a

"SAVA RIVER WATERSHED AGENCY" (mark) "SAVA RIVER WATERSHED AGENCY"
SARAJEVO SARAJEVO

Address: **Hamdije Cemerlica st. 39a** Tel.: +387 33 726 400
71000 Sarajevo Fax.: +387 33 726 423
http:/www.voda.ba e-mail: info@voda.ba

UNDP BiH
Un House, Zmaja od Bosne bb
71000 Sarajevo

Our ref.: 10-608-2/14

Your ref.:

Date: Sarajevo, 19.06.2014.

SUBJECT: Support letter to implementation of the project Climate Change Integration in Flood risk reduction in Vrbas River Basin (Technology transfer for climate resilient flood management in Vrbas river basin)

Dear Mr. Afanasiev,

By the Law on Waters of Federation of BiH "Sava River Watershed Agency" is in charge of implementing assignments of water management that are by this Law and regulations issued pursuant this Law, put under their jurisdiction. One of the important tasks of the Agency is also, ensuring protection from harmful water effects. During the 2010, the Agency started with implementation of Directive 2007/60/EC about assessment and flood risk management. This Directive requires from member states (and also, from countries in process of accession and pre-accession countries) to assess if all water flows and coastlines are under flood risk, to map flood extent and properties and people in risk in this areas, and also, to undertake adequate and coordinated measures for flood risk reduction. In accordance to that, the Agency has taken several measures including preliminary flood risk assessment of basins and related coastlines, identification of areas under potentially significant flood risk, creation of hazard maps and flood risk maps for areas under real risk from flood damages, and flood risk management plans for this zones.

In the above activities related to implementation of Directive on Assessment and Flood Risk Management, the Agency will implement funds of total value 600,000.00 BAM (417,000.00 USD) by end of 2014. The next step is finalization of activities on preparation of hazard risk maps and flood risk maps. The implementation of works of water flow regulation in FBiH, as well as in Vrbas Basin will be based on project results. For above mentioned activities around 1,000,000.00 BAM (700,000.00 USD) is planned in Vrbas Basin in next 5 years.

Considering limited human as well as financial resources, any support in joint activity on waters protection is welcomed. Related to this, we would like to confirm that project "Technology transfer for climate resilient flood management in Vrbas river basin" is of major importance for Bosnia and Herzegovina, especially because it will significantly improve flood risk management system of Vrbas River Basin. Other basins in the country will also benefit from results of this project, especially considering integration of climatic scenarios in the calculations. Moreover, by joint work on this project additional human capacities will be developed for future activities in this area in Bosnia and Herzegovina. Therefore we want to support this project and hope to have successful cooperation.

With respect,

DIRECTOR

To deliver: (seal) (signature)

-To the subject Sejad Delic, Dipl. Eng.
-Sector 10,
-a/a

Empowered lives.
Resilient nations.

Sarajevo, 30 Oct 2014

Dear Ms. Ishii,

Subject: **Letter of Co-financing - SCCF project proposal "Technology transfer for climate resilient flood management in Vrbas River Basin"**

This is in reference to UNDP Country Office, BiH commitment to further support implementation of the Project "Technology transfer for climate resilient flood management in Vrbas River Basin"

BiH's Initial National Communication (INC) and the Second National Communication (SNC) to UNFCCC have identified that Bosnia and Herzegovina is very vulnerable to climate changes which will accelerate during the remainder of the twenty-first century. Furthermore, it is indicated that extreme events, especially floods and droughts, will occur more frequently.

Having in mind the above mentioned, it is very important to address climate changes in the Country, especially identified adaptation measures. Human, as well financial capacities in the Country in this sector are very weak and proposed project is very important, as it strives to remove barriers to integrate climate changes in flood risk management.

In this respect, I would like to inform you that UNDP CO in Bosnia and Herzegovina is implementing two projects that are in direct linkage with above project. Vrbas River Basin Environment and Tourism Development programme with value of USD 1.25 million and Disaster Risk Reduction activities in Bosnia and Herzegovina with value of USD 2,000,000. UNDP CO BiH's DRR/Resilience to floods Programme in Bosnia and Herzegovina will directly contribute to the outcomes of the proposed SCCF project with a total amount of USD 1.5 million until 2020. Therefore, by this letter I would like to confirm that "Technology transfer for climate resilient flood management in Vrbas River Basin" project would be interlinked with existing projects and initiatives in Vrbas River Basin and that the amount of at least USD 1.5 million could be considered as cash co-financing.

In addition to the above, UNDP CO, BiH will provide in-kind financing in the amount of USD 60,000 for the project premises rental and maintenance.

Looking forward for your kind consideration and approval of this important project.

Sincerely,
Yuri Afanasiev
Resident Representative

TO: Dr. Naoko Ishii
CEO and Chairperson
Global Environmental Facility

United Nations Development Programme, Bosnia and Herzegovina, Zmaja od Bosne b.b., 71000 Sarajevo
T + 387 (0)33 293 400 | F + 387 (0)33 552 330 | E registry.ba@undp.org | W www.ba.undp.org

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Annex 4. Key assessment reports

1. Socio-Economic Assessment in the Vrbas River Basin, Edin Zahirovic M.Sc.,

2. Environmental and Social Screening Report, Edin Zahirovic M.Sc.,

3.Baseline Study on Water and Flood Management Issues in the VRB, Dalila Jabucar, M.Sc. Civ. Eng.

4.Overview of Institutional and Legislative Framework Relevant for Flood Management, Dalila Jabucar, M.Sc. Civ. Eng.,

5 List of sites for adaptation measures in Vrbas River Basin, Dalila Jabucar, M.Sc. Civ. Eng.,

6. Report on Review of Institutional Set up for FRM in Vrbas River Basin, Djordje Stefanovic, BSc Law

7. Gender Assessment Report, Klelija Balta, M.Sc., Political Science,

8.Climate Change and Adaptation in VRB, Goran Trbic, Dr ,Geography and Environment

Climate Change and Adaptation in VRB-summary report

Background physical and geographic characteristics of the catchment areas and the flow of the river Vrbas

The information contained in this chapter are partly taken from the study of" Creation of GIS database and mapping pollutants in the river Vrbas http://gis.pmfbl.org/vrbas/index.html and "Integrated River Basin Energy Study of the Development of the Sava River Vrbas, Module 1 – Water Resources", created removed COWI AS in Norway 2012..http://www.wbvrbasstudy.com/dokumenti.html

Climatic characteristic[22]

The circulation of the atmosphere and terrain orography impact on the climate characteristics and cause different types of climate in the Vrbas River Basin (VRB). North and central area of the VRB is characterized by continental and temperate continental climate, while the southern part of the basin is characterized by sub-mountainous and mountainous climate. Average annual air temperature range between 6-8°C in the south and 10-12°C in the north. The average rainfall varies from 1,000 mm per year in the north to about 1500 mm per year in the south. The average amount of precipitation that fall into the basin each year is 6.95 x 10 m^3.

Average potential evaporation is about 700 mm, which exceeds precipitation during the summer months. Almost half of the average amount of precipitation returns to the atmosphere by evaporation, and the average annual runoff is equal to 600 mm per year. Average runoff coefficient is estimated at 0.59.

Rating of climate change amplitude was done on the basis of data analysis obtained from the Hydro Meteorological Institute of Republika Srpska and Hydro Meteorological Institute of Federation of Bosnia and Herzegovina. The analyses included data from 22 weather stations with homogeneous series of observations or with possibility for adequate approximation. Especial attention was paid to the analysis of data recorded by meteorological instruments based in VRB (Jajce, Bugojno and Banja Luka). Determination of climate change is based on analysis of changes in air temperature and precipitation. Detailed analyzes consisted of identifying of differences in annual air temperature and precipitation for the period 1961-1990. and 1981-2010, and also analyzes of the trends of changes in air temperature and precipitation. In particular, analyzes of air temperature and precipitation for the stations in Banja Luka and Bugojno (VRB), covering period of 1951-2013.

Change of temperature

Examination of temperature change for the period 1961-2010. recorded increase of the temperature in all parts of the Vrbas valley. Based on comparative analysis of the period 1981-2010 and the period 1961 to 1990. it was detected that temperature raised in average about 0.8°C during the summer period. The

[22]SNC Bosnia and Herzegovina under UNFCCC; Analyses were made on the basis of data obtained from the processing of Hydro Meteorological Institute (HMI) of Republika Srpska and HMI of Federation of Bosnia and Herzegovina.

biggest rise of the temperature is recorded during the spring and winter in the northern central parts of VRB (Banja Luka 0.7°C). The lowest temperature rise is recorded during the fall and it varies in the interval from 0.1 to 0.3°C (Figure 1).

Increase of air temperatures annually varies from 0.4 to 1.0°C, while the temperature rise in the vegetation period goes up to 1.0°C. However, increase of temperature during the last decade has been more expressed. It should be noted that the increase of temperature, combined with increase of GHG emissions, conditioned and increased insolation and effect of urban heat islands.

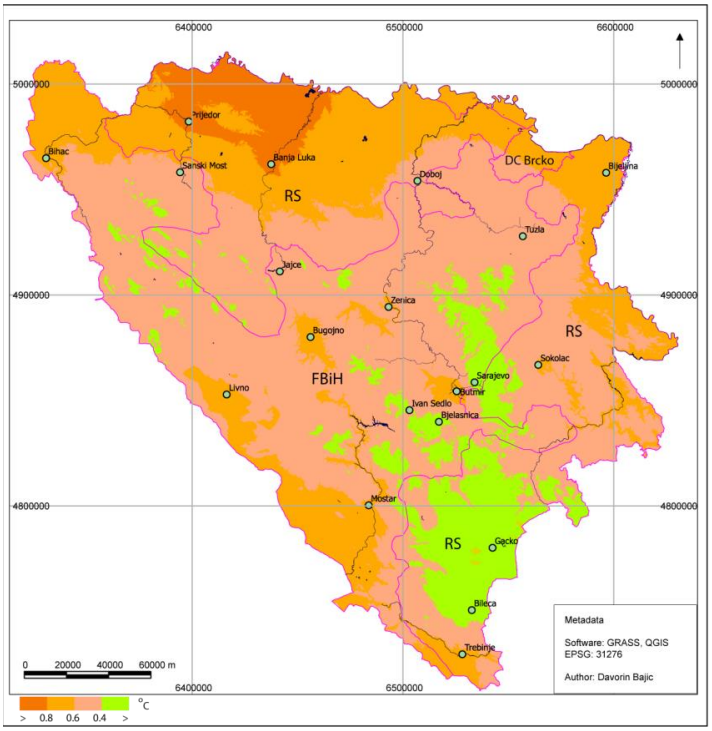
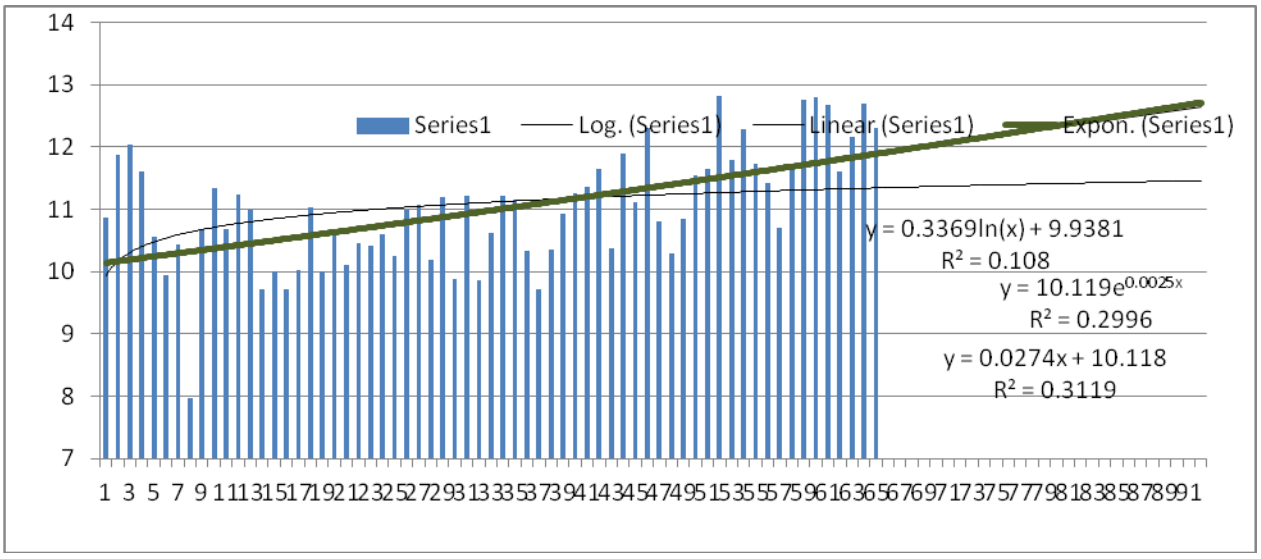


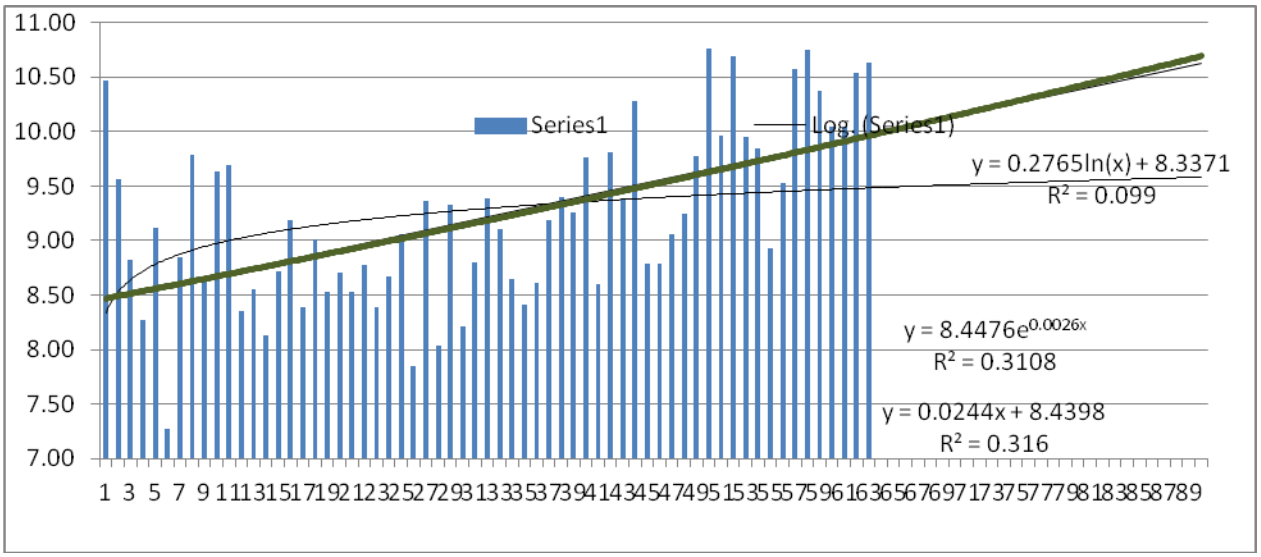
Figure 1: Changes in annual temperatures in Bosnia and Herzegovina (comparison period 1981 to 2010. compared to 1961-1990.

Changes in temperature in the vegetation period range up to 1°C. The greatest increase is recorded in urban areas and in the northern part of the VRB.



Graph 1: Change in annual temperatures in Banja Luka (1949-2013).

The first graph shows the change in temperature in Banja Luka on an annual basis, and the reversal (intensity and logarithmic) temperatures.



Graph 2: Change in annual temperatures for Bugojno (1951-2013).

The graph 2 shows the change in temperature in Bugojno on annual basis, and the reversal (intensity and logarithmic) temperatures. Increase of temperature is evident.

Changes in precipitation

The average annual rainfall in the period 1961-1990. ranged from 900 to 1500mm. The highest precipitation quantity occurred in the upper part of the VRB. Slight increase in rainfall over the whole catchment area is evident in the period from 1981 to 2010. Comparing the changes (period 1981-2010. compared to 1961-1990), we concluded that increase of precipitation on annual base is evident in the most of VRB territory. The increase ranges up to 60 mm per year. Only in area of Jajce municipality it is recorded a slight decrease of precipitation (Figure 2).

The number of days with precipitation above 1mm, decreased in almost the whole area of VRB, while the percentage of annual precipitation due to rainfall above 95th percentile during the period 1961-2010. was increasing. In other words, although the level of annual precipitation has
not significantly changed, a decrease in number of days with rainfall above 1.0 mm and an increase in the number of days with intense rain events has significantly distorted the pluviometric regime. Pronounced variability in the annual rainfall regime and temperature increases are key factors in the occurrence of more frequent and intense floods and droughts in the VRB.

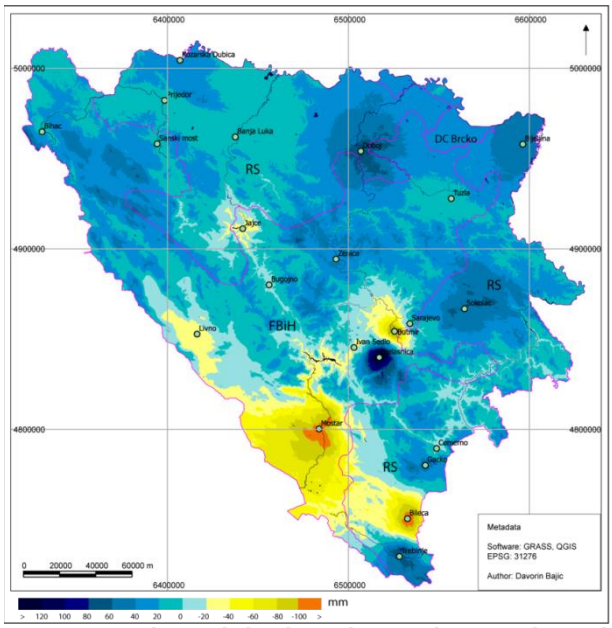


Figure 2: Average annual precipitation change in Bosnia and Herzegovina (1981 to 2010. compared to 1961-1990).

Scenarios of climate change in Bosnia and Herzegovina

One of the main tasks of the Second National Communication of Bosnia and Herzegovina on under the UNFCCC is a development of climate models and selection of adequate future climate change scenarios. Model results were analyzed for the time series 2001-2013 and 2071-2100. The report focuses on two basic ground meteorological parameters: air temperature at 2 meters and accumulated precipitation. Changes in these parameters are shown with reference to mean values from the so-called base (standard) period 1961-1990.

Results of dynamic range ECHAM5 models

A1B SCENARIO, 2001-2030

According to climate model results, the mean seasonal temperature changes for the observed thirty-tear period (2001-2030) are expected to show a slight increase in temperature during all seasons, comparing to the reference period 1961-1990. As for precipitation, the model showed a slight increase at the largest part of the Bosnia and Herzegovina, during almost all seasons. The trend of increasing precipitation continues during JJA (June, July, August), with maximum of up to 10% in the west. Unlike of other seasons, during SON season (September, October, November) it is expected precipitation increase of +5% in the northeast, and in small areas in the far northwest of Bosnia and Herzegovina.

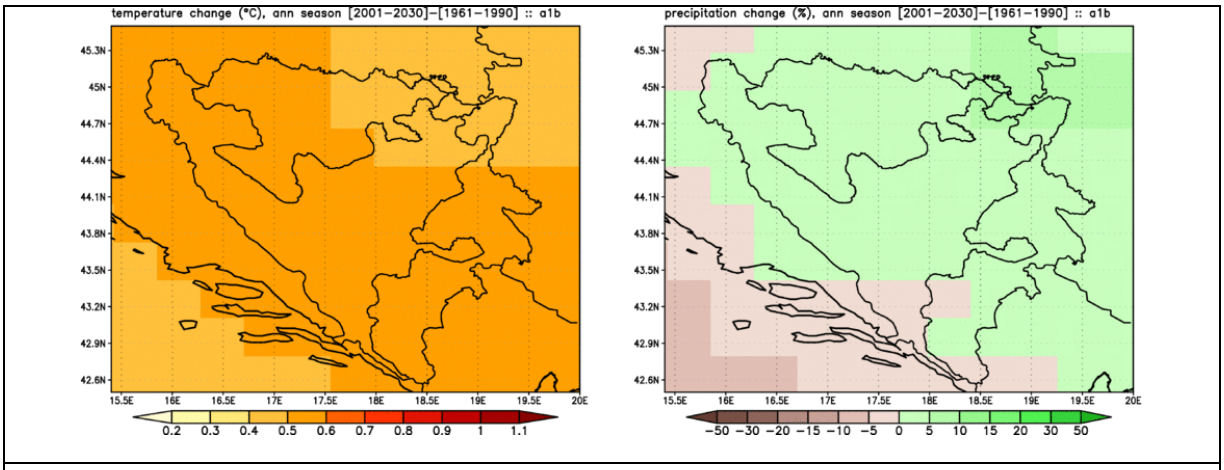


Figure 3: Average annual temperature change in ° C (left) and precipitation change in % (right).

The increase of average annual temperature in most parts of Bosnia and Herzegovina is 0.6°C, while on the northeast is slightly lower up to 0.4°C. The annual precipitation sum increases on the almost entire territory of the state, and it is up to 5%. The exceptions are the some north-east areas, where is expected increase of 10%, and southwest with expected precipitation decrease of -5%.

A1B SCENARIO, 2071-2100

According to the A1B scenario for the period of 2071-2100, increase on temperature is expected in the entire territory of BiH. The biggest increase will be during the summer months (June, July, August).

Unlike the previous simulations, the model for the period 2071-2100 shows precipitation decrease which is the most expressed during the summer, and only during the spring season is expected some increase.

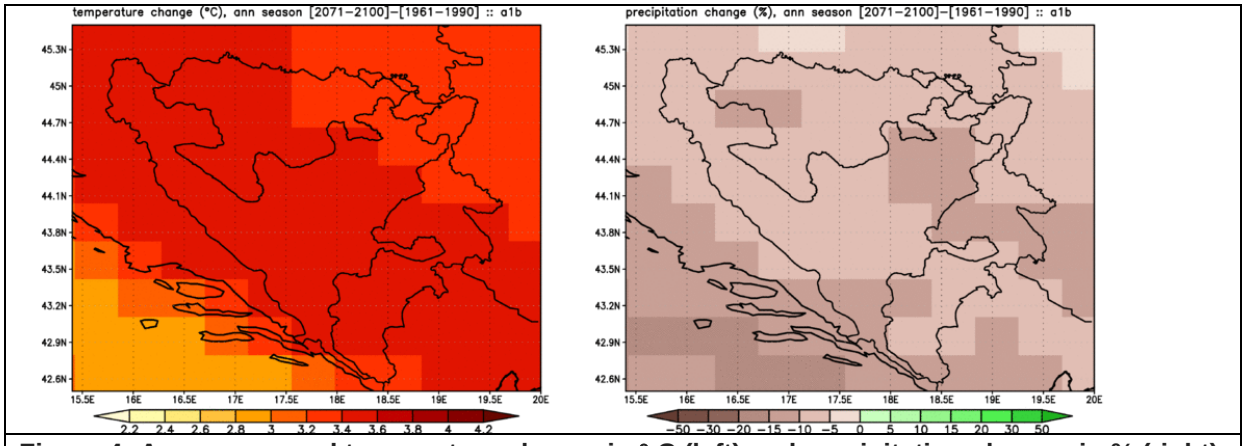


Figure 4: Average annual temperature change in ° C (left) and precipitation change in % (right).

Comparing of previously observed period (2001-2013), with the scenario A1B for period 2071-2100 shows that changes in corresponding parameters are similar, but magnitude of changes is greater. Expected changes in temperature range from 3.4°C to 3.6°C at the annual level. The change of annual precipitation is negative, mainly from -5 to -10%, with areas on the south, east and north of the country where the surplus slightly more pexpressed, up to -15%.

A2 SCENARIO, 2071-2100

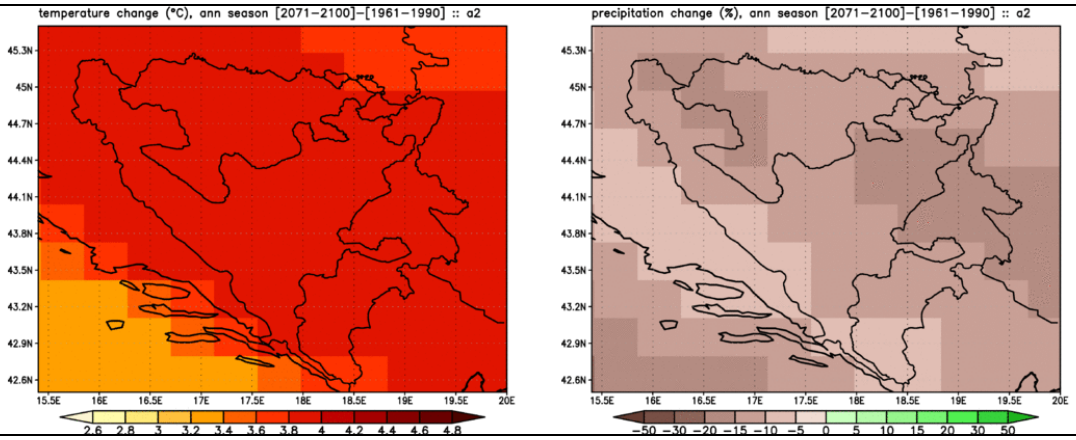


Figure 5:. Average annual temperature change in ° C (left) and precipitation change in % (right).

According to this scenario annual temperature increase for about 4°C is expected in the entire territory of Bosnia and Herzegovina, with slightly lower increase of 3.8°C on southern parts of the country. Annual rainfall deficit would be most expressed on the east and northeast of the state, up to -20%, while on the south and southwest will be slightly lower, up to -5%.

SUMMARY TABLE SHOWING THE SCENARIOS

Tables 1. and 2. to give the ranges of temperature and precipitation changes from season to season for presents three scenarios.

Table 1. Change of temperature in °C.

	A1B 2001-2030	A1B 2071-2100	A2 2071-2100
DJF	0.2 – 0.5	3 – 3.8	3.2 – 4
MAM	< 0.2	2.2 – 2.6	2.6 – 3.2
JJA	0.5 – 0.8	4 – 4.2	4.4 – 4.8
SON	0.9 – 1.1	3.4 – 3.8	3.8 – 4.2
YEAR	0.4 – 0.6	3.2 – 3.6	3.6 – 4.0

Table 2. Change precipitation in %.

	A1B 2001-2030	A1B 2071-2100	A2 2071-2100
DJF	0 – 10	-15 – 5	-30 – 15
MAM	0 – 15	-5 – 15	-10 – 10
JJA	-10 – 10	-50 – -20	-50 – -20
SON	-10 – 5	-30 – -5	-20 – 0
YEAR	-5 – 10	-15 – -5	-20 – -5

Impact of climate change on water resources in the VRB

It is expected that water systems will be exposed to impacts associated with climate change. Reduced amounts of rainfall during the summer, which are associated with regional decrease of annual precipitation and an increase of air temperature, will contribute to the increase frequency of droughts in the summer. However, in the spring and autumn it is expected that incidence of flooding will be increased. It is expected that these will be more extreme weather conditions occur on average every 5-10 years. Also dry, waterless period will be extended as a result of reduced precipitation during the summer, combined with increased rates of evaporation. The water level in rivers will reduce, especially during the summer and early fall, which will affect the water quality. The low water levels and drought will continue during the summer months, which will affect the drinking water supply (especially in rural communities) and also tourism.

Climatological aspects of rainfall from April to May 2014

Since 1881 in Banja Luka, the monthly rainfall above 200mm in May was measured only in 1899 (267 mm), 1919 (247mm), 1897 (214mm) and 1996 (203 mm). The amount of rainfall recorded this May over a 20-day period was 210 mm. This makes it is the fourth wettest May in the last 134 years, and possibly longer.

The data obtained from the MHS of the Republika Srpska show that such a high amount of rainfall over seven days in May has not been recorded since 1920 in the whole of BiH, with the exception of Eastern Herzegovina. Given that April was categorised as “wet” to “extremely wet”, and that no monthly rainfall amounts such high have been recorded in the month of April since 1925, the ground was waterlogged, causing unprecedented floods with unforeseeable consequences.

Analysis of the extremely heavy rainfall shows that such rains lasting for 3–8 days, in localities with moderately continental and continental rainfall patterns, have a return period of 500–1000 years (less than a 0.2% chance of occurring in any given year).

Such intense precipitation is more characteristic of regions with the Mediterranean rainfall regime and its modifications. (The concept of return period refers to how likely a value being measured is to occur. A one-thousand-year rain is a rain event that has a 0.1% probability of occurring at least once in any given year in the next 1000 years). .

In the Bosnia and Herzegovina, the 72- and 96-hour total precipitation on the entire territory on 20–22 June 2010 was higher than rainfall received during the same length of time during the period 12–20 May, but the latter rain episode continued for 6-8 days in a row, which was atypical, resulting in floods that were much worse than those in June 2010.

Hydrological aspect of flood, May 2014

Preliminary analysis of water level of the river during flooding in May 2014

In the period 14–22 May 2014, catastrophic floods hit the Republika Srpska. After several days of rainfall in early May, water levels of rivers rose between 3 May and 8 May, exceeding the standard and emergency flood defence limits at some hydrological stations. After that the situation stabilised somewhat and water levels started to decline to normal range values.

Similarly, on the Vrbas River, at the hydrological station Delibašino Selo, the water level rose by 7 metres between 14 and 16 May, reaching the record value of 837 cm on 16 May – that is 150 cm higher than the previous record value of 687 cm measured at this hydrological station, which was recorded in September 1996.

Given that Vrbas belongs to the Sava River Basin, the flood waves on rivers in the Republika Srpska caused an increase in the water level of the Sava River, which exceeded the EMERGENCY FLOOD DEFENCE LIMIT in Gradiška, mainly due to the impact of the Una River.

Annex 5. Stakeholder meetings, workshops and consultations held during project preparation

17 March, 2014-Site visit/Field consultation

1. **Gornji Vakuf -Meeting with municipal officials and visit to flooded area**
    - Sead Causevic, Mayor
    - Adis Agic, Municipal Coordinator
    - Suad Sisic Department for Development, Housing and Utilities
    - Branko Sain, Mayor's Assistant for Civil Protection
    - Margareta Ayoung, Hydrologist, International Expert
    - Dalila Jabucar, Hydrologist, Local Expert
    - Edin Zahirovic, Economist, Local Expert
    - Goran Vukmir, Head of Banjaluka Regional Representation Office UNDP
    - Igor Palandzic, Project Officer,UNDP
    - Sladjana Bundalo, Field Officer, UNDP
2. **Celinac -Meeting with municipal officials and visit to flooded area**
    - Milan Tepić, Deputy Mayor
    - Vitomir Kuzmanovć, Head of Department for Economic and Social Activities
    - Aleksandar Brankovic, Director of Development Agency Čelinac
    - Margareta Ayoung, Hydrologist, International Expert
    - Dalila Jabucar, Hydrologist, Local Expert
    - Edin Zahirovic, Economist, Local Expert
    - Goran Vukmir, Head of Banjaluka Regional Representation Office UNDP
    - Igor Palandzic, Project Officer,UNDP
    - Sladjana Bundalo, Field Officer, UNDP

18th March '14: 1st Meeting and project idea presentation

LIST OF PARTICIPANTS

No.	**Name**	**Position**	**Institution**
1.	Vitomir Kuzmanovć	Head of Department for Economic and Social Activities	Municipality Čelinac
2.	Aleksandar Branković	Director	Development Agency Čelinac
3.	Đorđe Stefanović	Consultant	UNDP Project
4.	Dalibor Vrhovac	Senior Associate	Public Company "Waters of Srpska"
5.	Marija Šmanja	Associate for Project Management	Municipality Šipovo
6.	Borjana Babić	Associate for the preparation of investment in the field of hydraulic engineering	City Administration of Banja Luka
7.	Kosorić Siniša	Head Inspector	Police Department of the Ministry of Internal Affairs of the Republic of Srpska
8.	Mile Međed	Head of Civil Protection of R.Srpska	Ministry of Internal Affairs of the Republic

			of Srpska, Civil Protection Republic of Srpska
9.	Mladen Lunić	Associate for Environmental Protection	Municipality Laktaši
10.	Slađana Zvizdalo - Suvajac	Associate	Municipality Srbac
11.	Ninko Gužvić	Associate for Agriculture and Water Management	Municipality Srbac
12.	Idriz Brković	Head of Department for Strategic Planning	Ministry of Security BIH Sector for Protection and Rescue
13.	Renata Salihodžić	Legal Assistant	Una Consulting
14.	Kemal Hadžić	Consultant, engineer	Una Consulting Bihać
15.	Vesna Rubin	Director's Assistant	Cantonal Administration for Civil Protection Central Bosnia Canton
16.	Nenad Bratić	Senior Officer	???
17.	Sandi Zulić	Director	Una Consulting
18.	Sead Badnjević	Project Engineer	Una Consulting
19.	Sanjin Avdić	Head of Energy and Environment Sector	UNDP CO BIH
20.	Margaretta Ayoung	UNDP International Consultant	Independent
21.	Dalila Jabučar	UNDP,Local Consultant	Independent
22.	Klelija Balta	UNDP,Local Consultant	Independent
23.	Srebrenka Golic	Minister	Ministry of urban planning, engineering and ecology, Republic of Srpska
24.	Svjetlana Radusin	Assistant to the Minister	Ministry of urban planning, engineering and ecology, Republic of Srpska
25.	Mehmed Cero	Assistant to the Minister	Ministry of Environment and Tourism, Federation of Bosnia and Herzegovina
26.	Edin Zahirović	UNDP,Local Consultant	Centre for Development and Support (CRP)
27.	Aleksandra Kovačević	Senior Associate for the protection and use of water	Office for Vrbas Basin "Vode Srpske"
28.	Vesna Sofilj	Senior Associate for flood protection	Office for Vrbas Basin "Vode Srpske"
29.	Marinko Vranić	Senior Associate for EU Integration	Ministry of agriculture, forestry and water management, Republic of Srpska
30.	Nemanja Jungić	Horticulture Engineer	-
31.	Nenad Đukić	Senior Associate for water	Ministry of agriculture, forestry and water management, Republic of Srpska
32.	Velinka Topalović	Head of Office for Vrbas basin	"Vode Srpske" Office in Banja Luka
33.	Marko Barić	Head of regional office	Sava River Water Agency
34.	Suad Skejović	Senior Advisor	Ministry of Agriculture,

			Water Management and Forestry, Federation of Bosnia and Herzegovina
35.	Darko Borojević	Head of Department for hydrology	Hydro meteorological Institute of Republic of Srpska
36.	Nino Rimac	Head of Department for forecast and water balance	Hydro meteorological Institute Federation of Bosnia and Herezgovina
37.	Vaso Milišić	Senior Associate	City Administration of Banja Luka
38.	Ragib Šehtić	Senior Officer for for hydrometer	Hydro meteorological Institute Federation of Bosnia and Herezgovina
39.	Amela Ćosanć Medić	Sector Leader	UNDP
40.	Aida Hadžić Hurem	Programme Associate	UNDP
41.	Raduška Cupać	Project Manager	UNDP
42.	Sanjin Avdic	Sector Leader	UNDP
43.	Igor Palandzic	Project Officer	UNDP
44.	Sladjana Bundalo	Field Officer	UNDP
45.	Anna Kaplina	Regional Technical Specialist	UNDP
46.	Dalibor Đurašinović	Senior Advisor, Mayor's Office	Municipality Kotor Varoš
47.	Nataša Savković	Assistant Director of Legal Affairs	Fund for Environmental Protection and Energy Efficiency Republic of Srpska
48.	Ivana Tešanović	Associate of International Cooperation	Fund for Environmental Protection and Energy Efficiency Republic of Srpska

18/19 March, 2014: Working meeting UNDP/Consultants

1. Margareta Ayoung, Hydrologist, International/Lead Expert
2. Dalila Jabucar, Hydrologist, BiH Lead Expert
3. Edin Zahirovic, Economist, Local Expert
4. Djordje Stefanovic, Local Legal Expert
5. Klelija Balta, Local Gender Expert
6. Goran Trbic, Local Vulnerability Expert
7. Sanjin Avdic, Head of Energy and Environment Sector, UNDP
8. Igor Palandzic, Project Officer ,UNDP
9. Raduska Cupac, Project Manager, UNDP
10. Anna Kaplina, Regional Technical Specialist on Adaptation, UNDP
11. Sladjana Bundalo, Field Officer, UNDP

4th-16th April, 2014: Municipal consultations during ProDoc preparation –Questioners

No.	Municipality/City	Date	Consulted officials (name)	Position within Municipality

1.	Jajce	04 April ’14.	Edin Hozen	Mayor
2.	Jajce		Esad Duranovic	Mayor’s Assistant for Civil Protection
3.	Jajce		Nijaz Duranovic	Civil Protection
4.	Celinac	08 April ’14.	Vitomir Kuzmanovic	Head of Department for Economic and Social Activities
5.	Celinac		Miroslav Babic	Department for Economic Activities
6.	Celinac		Aleksandar Brankovic	Development Agency
7.	Celinac		Petra Ilic	Department for Spatial Planning, Housing and Utilities
8.	Celinac		Mirislav Spasojecic	Municipal Civil Protection
9.	Gornji Vakuf	09 April ’14.	Adis Agic	Municipal Coordinator
10	Gornji Vakuf		Suad Sisic	Department for Development, Housing and Utilities
11	Gornji Vakuf		Branko Sain	Mayor’s Assistant for Civil Protection
12	Gornji Vakuf		Rasim Bilkan	Civil Protection
13	Donji Vakuf	09 April ’14.	Huso Susic	Mayor
14	Donji Vakuf		Mirsad Kosovac	Mayor’s Assistant for Civil Protection
15	Jezero	10 April ’14.	Dusan Sain	Mayor
16	Jezero		Radivoje Duvnjak	Secretary of Municipality
17	Banjaluka (City)	11 April ’14.	Zeljko Katic	Head of Civil Protection
18	Banjaluka (City)		Mile Lazendic	Civil Protection
19	Laktasi	11 April ’14.	Ivica Dejanovic	Head of Civil Protection
20	Laktasi		Slavko Knezevic	Department for Economy and Agriculture
21	Laktasi		Dragan Kelecevic	Head of the Office for Local Economic Development
22	Kotor Varos	14 April ’14.	Milivoje Popovic	Fire Department
23	Kotor Varos		Dalibor Djurasinovic	Mayor’s Office
24	Kotor Varos		Sandi Aksic	Construction Inspector
25	Kotor Varos		Vanja Kupresak	Head of Department for Economic and Social Activities
	Kotor Varos		Gostimir Milic	Municipal Representative?
26	Kotor Varos		Milanko Popovic	Utility Company-Director
27	Srbac	14 April ’14.	Ninko Guzvic	Department for Economy and Agriculture- Head
28	Srbac		Sladjana Suvaja	Department for Economy and Agriculture
29	Srbac		Borivoje Vrsajković	Head of Civil Protection
30	Bugojno	15 April ’14.	Hasan Ajkunic	Mayor
31	Bugojno		Dzenana Abdalajbegovic	Departmet for Technical Services-Head
32	Knezevo	15 April ’14.	Bore Skeljic	Mayor
33	Knezevo		Vladimir Gojkovic	Development Department
34	Mrkonjic Grad	16 April ’14.	Tijana Radjevic-Drljaca	Mayor’s Office
35	Mrkonjic Grad		Mirko Vucenova	Civil Protection
36	Sipovo	16 April ’14.	Milorad Cirko	Mayor

37	Sipovo		Biljana Segrt	Civil Protection

04/05 June, 2014: Site visit/Field consultation

1. **City of Banjaluka**
   - Zeljko Katic, Head of Civil Protection Department
   - Mile Lazendic, Civil protection Department
   - Margareta Ayoung, Hydrologist, International Expert
   - Dalila Jabucar, Hydrologist, Local Expert
   - Igor Palandzic, Project Officer,UNDP
   - Sladjana Bundalo, Field Officer, UNDP
2. **Celinac Municipality**
   - Vidosav Kicic, President of Municipal's Assembly
   - Vitomir Kuzmanivic, Head of Department for Economic and Social Activities
   - Margareta Ayoung, Hydrologist, International Expert
   - Dalila Jabucar, Hydrologist, Local Expert
   - Igor Palandzic, Project Officer,UNDP
   - Sladjana Bundalo, Field Officer, UNDP
3. **Srbac Municipality**
   - Drago Ciric, Mayor
   - Ninko Gužvić, Associate for Agriculture and Water Management
   - Borivoje Vrsajković, Civil Protection
   - Margareta Ayoung, Hydrologist, International Expert
   - Dalila Jabucar, Hydrologist, Local Expert
   - Igor Palandzic, Project Officer,UNDP
   - Sladjana Bundalo, Field Officer, UNDP
4. **Laktasi Municipality**
   - Branka Zelic, Head of Department for Economic and Social Activities
   - Dragan Kelecevic, Head of the Office for Local Economic Development
   - Ivica Dejanovic, Head of Civil Protection
   - Margareta Ayoung, Hydrologist, International Expert
   - Dalila Jabucar, Hydrologist, Local Expert
   - Sladjana Bundalo, Field Officer, UNDP

06th June '14: 2nd Meeting : Introduction with potential non-structural solutions

LIST OF PARTICIPANTS

No.	Name	Position	Institution
1.	Alisa Grabus	Project Officer	UNDP
2.	Bojana Kondić Panić	Associate for development and EU integration	Municipality Laktaši
3.	Suad Skejović	Senior Advisor	Ministry of Agriculture, Water Management and Forestry, Federation of Bosnia and Herzegovina
4.	Boris Raljić	Deputy of the Mayor	Municipality Kneževo
5.	Marko Barić	Head of regional office	Sava River Water

			Agency
6.	Dalibor Vrhovac	Senior Associate	Ministry of agriculture, forestry and water management, Republic of Srpska, "Vode Srpske"
7.	Sead Cerić	Member of development team	Municipality D.Vakuf
8.	Huso Sušić	Mayor	Municipality D.Vakuf
9.	Milan Jeftenić	Space Planning Department	Municipality Šipovo
10.	Vitomir Kuzmaniović	Economy Department	Municipality Čelinac
11.	Dalibor Đurašinović	Independent Expert, Mayor's Office	Municipality Kotor Varoš
12.	Marko Zeljković	Deputy of the Mayor	Municipality Kotor Varoš
13.	Mile Lazendić	Independent Expert for civil protection	City Administration of Banja Luka
14.	Nevena Predojević	Advisor for Urban Planning and Construction	City Administration of Banja Luka
15.	Klelija Balta	UNDP,Local Consultant	UNDP
16.	Edin Zahirović	UNDP,Local Consultant	Centre for Development and Support (CRP)
17.	Margaretta Ayounig	UNDP International Consultant	UNDP
18.	Dalila Jabučar	UNDP,Local Consultant	UNDP
19.	Slađana Bundalo	Field Officer	UNDP

Organisations contacted regarding Gender Equality

No	Organization	Contact	Contact person
1.	B&H Gender Equality Agency	+ 387 (0) 33 209-761 protokol @arsbih.gov.ba	Kika Babić Svetlin
2.	The Government of RS Gender Centre	+387 51 247 427 j.milinovic@gc.vladars.net	Jelena Milinović
3.	The Government of F BiH Gender Centre	+387 33 665 883 sadmira.kotoric@gcfbih.gov.ba	Sadmira Kotorić
4.	Centre for Legal Aid for Women, Zenica	+387 32 40 20 49 czppzz@gmail.com	Meliha Sendić
5.	Centre for Ecology and Energy, Tuzla	+387 35 249 310 amira.kunto@ekologija.ba	Amira Kunto
6.	United Women of Banja Luka	+387 51 462 146 office@unitedwomenbl.org	Aleksandra Petrić
7.	Amica EDUCA, Tuzla	+387 35 248-910 educa@bih.net.ba	Ivona Erdeljac

Annex 6. Stakeholder involvement plan

Name of institutions /stakeholders consulted	Stakeholder interests, official position or mandate	Relevance to the Project / Reasons for inclusion	Modality of involvement
BiH Ministry of Foreign Trade and Economic Relations	State level Responsible for coordinating policies and measures in the field of the environment.	Location of GEF Operational Focal Point Coordination, advocating -Member of Project Board	Formal review of the Vrbas DRR project proposal Regular consultations, participation and active work in Vrbas DRR Project Board, Participation in preparation of sectoral policies and plans
RS Ministry of Spatial Planning, Construction, and Ecology	Entity level Responsible for environmental policies and measures in RS, including environmental measures that may mitigate CC. Responsible for integrative planning and spatial planning in RS. UNFCCC focal point.	UNFCCC focal point. Sectoral policies and plans will be updated in order to include CC modelling results- will be informed on project activities and results. -Member of Project Board	Formal review of the Vrbas DRR project proposal Regular consultations, participation and active work in Vrbas DRR Project Board, Participation in preparation of sectoral policies and plans
F BiH Ministry of Agriculture, Water-Management, and Forestry	Entity level Responsible for coordinating policies and measures in agriculture, water-management and forestry	Sectoral policies and plans will be updated in order to include CC modelling results- will be informed on project activities and results. -Member of Project Board	Formal review of the Vrbas DRR project proposal Regular consultations, participation and active work in Vrbas DRR Project Board, Participation in preparation of sectoral policies and plans
RS Ministry of Agriculture, Forestry, and Water Resources	Entity level Responsible for coordinating policies and measures in land use, forestry, and water resources	Sectoral policies and plans will be updated in order to include CC modelling results- will be informed on project activities and results. -Member of Project Board	Formal review of the Vrbas DRR project proposal Regular consultations, participation and active work in Vrbas DRR Project Board, Participation in preparation of sectoral policies and plans

Federal BiH Ministry of Environment and Tourism	Responsible for coordinating entity-level policies and measures in the environmental area (environmental conservation, preparation of environmental policies and strategies, monitoring of environmental factors)	Sectoral policies and plans will be updated in order to include CC modelling results- will be informed on project activities and results -Member of Project Board	Formal review of the Vrbas DRR project proposal Regular consultations, participation and active work in Vrbas DRR Project Board, Participation in preparation of sectoral policies and plans
Ministry of Security of BiH	State level Responsible for implementation of international obligations and cooperation in matters relating to civil protection, coordination of activities of entity services for civil protection in BiH, and harmonization of their plans for cases of natural or other disasters striking BiH territories, as well as issuance of agenda for protection and rescue	State level coordination body for protection and rescue. Sectoral policies and plans will be updated in order to include CC modelling results- will be informed on project activities and results.	Participation in preparation of sectoral policies and plans, support to development coordination mechanisms for civil protection, support to preparation disaster preparedness and response plans, development of EWS
Sava River Basin Agency	Management of Sava river basin (within BiH), data collection and distribution, water monitoring (hydrology and quality), preparation of Water management plans and plans for prevention and reduction of harmful impacts (flood, drought , erosion), preparation of legislation and policies, projects implementation	Main management body of Sava river basin. Sectoral policies and plans will be updated, and hydrodynamic model will be improved in order to incorporate CC- will be informed on project activities and results	Data provider: responsible and accountable for technical inputs and providing data and analyses Participation in preparation of sectoral policies and plans
Public Institution Waters of Srpska	Management of water resources within RS Entity Preparation of Water management plans and monitor their implementation	Main management body of RS water resources Sectoral policies and plans will be updated, and hydrodynamic model will be improved in order to	Data provider: responsible and accountable for technical inputs and providing data and analyses Participation in preparation of sectoral policies and plans

		incorporate CC- should be informed on project activities and results Institutional capacities will be strengthened on induced FRM, climate risk assessment, scenario based planning for water sector- should actively participate	Beneficiary- raising institutional capacity
Hydro-meteorological Institute of RS	Entity body Collects climatic and hydrological data necessary for studying climate variability, for trend analysis, and for long-run modelling. Conducts modelling and participates in WMO research programs.	Climatic and hydrological data are essential to the Vrbas DRR Data provider	Data provider: responsible and accountable for technical inputs and providing data and analyses Beneficiary- raising institutional and technical capacity Review and inputs in the Vrbas DRR project proposal development process
Hydro-meteorological Institute of F BiH	Entity body Collects climatic data necessary for studying climate variability, for trend analysis, and for long-run modelling.	Climatic and hydrological data are essential to the Vrbas DRR Data provider	Data provider: responsible and accountable for technical inputs and providing data and analyses Beneficiary- raising institutional and technical capacity Review and inputs in the Vrbas DRR project proposal development process
Local Governments	Municipal bodies Management of public functions/ activities within local communities Preparation of development plans and programmes Organization and management of civil protection Spatial planning Local economic development	Local development plans and policies will influence the findings of the Vrbas DRR in order to incorporate CC- will be informed on project activities and results Develop local spatial plans Organize and manage civil protection at local level Data provider	Active participation in project implementation: nomination of reference group, participatory risk assessment, participation in development of climate resilient adaptive measures, development of integrated flood risk management plan, raise capacities, raise community awareness and preparedness Beneficiaries: raising institutional and technical capacity

NGOs (environmental, social inclusion and protection organizations-for returnees and displaced persons, vulnerable groups, minorities, etc.)	NGOs Provide information, training, and awareness-raising	Can serve as a resource for public outreach related to the Vrbas DRR and to raising awareness among the public about climate change-related issues, Involvement of the most vulnerable groups, returnees, displaced people, minorities .	Active participation in project implementation: Rising awareness, delivering of adaptation activities and capacity development, provide trainings
Smallholder farmers, returnees and displaced persons	Innovators, Responsible Parties	Beneficiaries. Responsible for identification and delivering of adaptation activities; as well as project beneficiaries	Beneficiaries. Active participation in project implementation: participate in development and delivering adaptation measures, awareness raising, participatory risk assessment, participate in development of land use and flood risk management plan, participate at trainings on implementation and maintenance of flood resilient non-structural intervention measures
Private sector / Micro agricultural businesses	Financial services provider	Delivering of adaptation activities	Active participation in project implementation: development and implementation of adaptation measures
Faculties of Natural Sciences/Agriculture (Banja Luka and Sarajevo)	Universities, research institutions	The highest educational institutions in the field of ecology, physics, chemistry and Agriculture Data and technical service provider	Participation of students/individual experts in data collection and analysis for purposes of: “land use and flood risk management plan”, data base for loss and damage assessment

Annex 7. Terms of Reference for Project Personnel

Long term consultancy positions

Project Manager

Summary of key functions:

In consultation with the Project Board, the Project Manager (PM) is responsible for day-to-day management, co-ordination and supervision of the implementation of the Project. Specifically, his\her responsibilities are but not limited to the following:

1. Supervises and ensures the timely implementation of the project relevant activities;
2. Prepares a detailed work plan for the project, manages the procurement and the project budget to assure timely involvement of local and international experts, organisation of training and public outreach, purchase of required equipment etc. in accordance with UNDP rules and procedures;
3. Assures coordination among project activities;
4. Liaises with the relevant ministries, national and international research institutes, NGOs, and other relevant institutions in order to gather and disseminate information relevant to the project and organize realisation of project activities;
5. Supervises and coordinates the contracts of the experts working for the project;
6. Submission of annual Project Implementation Reviews and other required progress reports (such QPRs) to the PSC and the UNDP in accordance with the section "Monitoring and Evaluation" of the Project Document;
7. As applicable, communicating with the project's international partners and attracting additional financing in order to fulfil the project objectives; and
8. Ensuring otherwise successful completion of the project in accordance with the stated outcomes and performance indicators summarized in the project's results framework and within the planned schedule and budget.

Required Skills and Experience:

- Advanced degree in environment/development/management related studies or other related disciplines;
- Ten years experience in managing projects, including demonstrated capacity to actively explore new, innovative implementation and financing mechanisms to achieve the project objective;
- Good understanding of environment/development issues in BiH;
- Demonstrated experience in working with government, donors and the United Nations system;
- Good analytical and problem-solving skills and the related ability for adaptive management with prompt action on the conclusion and recommendations coming out from the project's regular monitoring and self-assessment activities as well as from periodic external evaluations;
- Ability and demonstrated success to work in a team, to effectively organize it, and to motivate its members and other project counterparts to effectively work towards the project's objective and expected outcomes;
- Good communication skills and competence in handling project's external relations at all levels;
- Familiarity and prior experience with UNDP and GEF requirements and procedures are considered as an asset;
- Fluency in English and local languages.

Flood Risk Management Technical Officer

Summary of key functions:

In consultation with the Project Manager (PM) specifically, his\her responsibilities consists of the following:

1. Provides technical input in policies development;
2. Takes part in development of technical and non-technical guidance documents for all studies and assessment undertaken as part of the project;
3. Undertake an assessment of the monitoring network requirements and provides technical assistance to improve hydrometric monitoring network;
4. Participate in mobilization of communities in the implementation in intervention plans;
5. Identify training needs, organises training and recommends institutional arrangements for management of hydrometric network;
6. Takes part in design and implementation of Flood Forecasting and Early Warning System;
7. Develop training plans , organises and oversees trainings in following areas: information management covering hydro meteorological data, flood depths and land use; flood risk modelling and mapping methods; flood risk assessment; development of early warning system;
8. Prepares integrated land use and FRM plan;
9. Takes a lead in selection of structural and non-structural measures;
10. Oversees implementation of non-structural interventions.

Required Skills and Experience:

- Degree in hydrology/building engineering;
- Minimum ten years of professional experience in Flood Risk Management,;
- Experience of the technical work in river basin flood risk management;
- Experience of the development of flood management and mitigations measures and strategies;
- Good analytical and problem-solving skills;
- Ability and demonstrated success to work in a team;
- Good communication skills and competence in handling project's external relations at all levels;
- Fluency in English.

Flood Risk Management in Vulnerable Communities Officer

Summary of key functions:

Under the direct supervision of the UNDP Project Manager / UN Project Coordinator and in close coordination with the Energy and Environment Sector, Project Officer will have the following main functions:

1. Organises and coordinates project's activities with vulnerable communities;
2. Monitor field activities implementation for the flood risk management activities in vulnerable communities;
3. Provides support in organization of external evaluation of the project;
4. Ensures efficiency in the provision of support to local stakeholders at municipal level;
5. Ensures that all project-related issues and risks are identified and reported in a timely manner and suggests corrective measures;
6. Co-ordinates the work of the Project Team, individual consultants and contracted companies;
7. Participates in flood risk assessment for agricultural land;
8. Organises and implements farm level training in flood resilient agricultural methods;
9. Assist PM in development of Flood Risk Management Plan in VRB;

10. Implements participatory community-based adaptation technologies;
11. Implements community based programmes for FRM;
12. Identify capacity needs of municipal departments/companies and provide necessary trainings;
13. Facilitate training process for identified communities on roles and responsibilities during flood emergency procedures;
14. Support work with vulnerable groups through participatory planning and implementation mechanisms;
15. Provides support to mainstreaming gender equality in the project implementation;

Required Skills and Experience:

- University degree in agriculture/ environment/ development related studies and other related disciplines;
- At least 5 years of relevant work experience;
- Good understanding of environment/development issues in BiH;
- Experience in managing tasks of similar complexity and nature;
- Demonstrated experience in working with local government;
- Familiarity and prior experience with UNDP and GEF requirements and procedures are considered as an asset;
- Ability and demonstrated success to work in a team;
- Good communication skills and competence in handling project's external relations at all levels.
- Fluency in English and local languages.

Project Assistant

Summary of key functions:

The Project Assistant will work under the direct supervision of the Project Manager and provide assistance to project implementation, the organization of training activities and financial management and reporting. The Project Assistant will be responsible for the following duties:

1. Manage day-to-day Project operations, particularly with respect to the provision of technical services and support;
2. Assist the Project Manager in the implementation of technical and operational activities;
3. Takes responsibility for logistics and administrative support of project implementation, including administrative management of the project budget, required procurement support, etc.
4. Maintains up to date business and financial documentation, in accordance with UNDP and other project reporting requirements;
5. Organizes meetings, business correspondence and other communications with the project partners;
6. Ensures effective dissemination of, and access to, information on project activities and results and supporting the project outreach and PR activities in general, including keeping the project web-site up to date;
7. Supporting the project manager in managing contracts, in organizing correspondence and in ensuring effective implementation of the project otherwise;
8. Maintain the Project's files and supporting documentation for payments;
9. Undertake other administrative/ financial duties as requested by the Project Coordinator;
10. Other duties which may be required.

Required Skills and Experience:

- Secondary education; University degree is considered as an asset level;
- Demonstrated experience and success of work in a similar position;
- Good administration and interpersonal skills;
- Ability to work effectively under pressure;
- Good computer skills;
- Fluency in English.

Short term consultancy positions

Climate Change Expert

Major Deliverables for the expert:

1. Detailed methodology to be agreed with the CTA and PM, detailing how the consultancy will be undertaken;
2. Report discussing data availability, quality and other analyses, on climate change in BiH and VRB;
3. Training plan for delivery of training for climate risk management experts, focusing on Climate change impact assessments methods, tools and technologies;
4. Developed hydrological parameters which incorporate climate change. Report detailing guidelines for incorporating climate change into hydrological modelling for VRB in particular and BiH in general;
5. Report detailing the full assessment of climate change impacts on key sectors in BiH;
6. Report outlining a methodology for incorporating climate change results into sector plans and policies, using the most advanced and appropriate methods and technologies;
7. Provision of training conduction on climate change assessment with national practitioners during the project, culminating in a training report;
8. Technical and non-technical guidance documents for all climate change studies and assessments undertaken as part of the project, to be used as a guide for future similar assessments, which would be updated on a 3-yearly basis to keep pace with advances in methods and technology;
9. Final consultancy report describing the process, methodology used, major deliverables and lessons learned;

Required Skills and Experience:

- MSc degree in hydrology or relevant field;
- Excellent understanding of global and local climate change issues and developments;
- Good understanding of developments in climate change forecasting/modelling and GIS;
- Proven strong analytical abilities;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Excellent writing, presentation/public speaking skills;
- A proactive approach to problem-solving;
- IT literacy;
- Fluency in English language;
- Minimum 10 (ten) years of professional experience in hydro-meteorology;
- International professional experience in climate change assessment - at least 2 (two) years or 2 similar international projects;
- Extensive experience in meteorology and climate change issues;
- Experience in Balkans region is preferable.

Chief Technical Advisor

Major Deliverables for the expert:

1. Technical input in policies development provided;
2. Article and footage prepared for every year to showcase what has been done and what has been learned annually;
3. Developed list of structural and non-structural options;
4. Short list of structural and non-structural options development prepared;
5. Hydraulic simulation of the short-listed options finalized;
6. Prepared integrated land use and FRM plan;
7. Developed community engagement, mobilization and sensitization plans;
8. Developed specific Intervention plans with participation of the local communities;
9. Successful mobilization of communities in the implementation in intervention plans;

Required Skills and Experience:

- Strong networking skills and demonstrated ability to liaise and involve partners including government officials, scientific institutions, NGOs and private sector;
- Familiarity with UNDP and UN systems desirable;
- Experience with international organizations/projects/programs;
- Excellent analytical skills;
- Capability to work under deadline pressure and to take on a range of tasks;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Excellent writing, presentation/public speaking skills;
- A proactive approach to problem-solving;
- IT literacy;
- Fluency in English language;
- Minimum - MSc degree in relevant field on Flood Risk Management, hydrology, forecasting and modeling, early warning systems;
- Minimum 15 (fifteen) years of professional experience in Flood Risk Management, hydrology, forecasting and modeling, early warning systems, project management, supervision, including work experience in BiH;
- Experience of the technical leadership of river basin flood risk management;
- Experience of the development of flood management and mitigations measures and strategies;
- In depth knowledge and experience of international best practice in all aspects of flood risk management;
- Charter ship/accreditation with relevant institution will be desirable;

GIS data/management expert

Major Deliverables for the expert:

1. User requirements specification report;
2. Data, metadata standards, manage spatial data sets;
3. Collection, collation and management of GIS data sets throughout the project;
4. System design document for the data repository;
5. Implemented GIS data repository platform in line with user requirements specification and approved data and meta data standards;
6. Data audit report on GIS data quality including gap analysis;
7. GIS analysis outputs in support of all project technical studies as necessary;
8. Ongoing update, maintenance and management of data repository;
9. Established project Spatial Data Infrastructure (SDI);

10. Ongoing GIS and Data management support throughout the project;
11. In cooperation with socio-economist expert:
    a. GIS-based tool to integrate various spatial socio-economic data with the flood hazard maps, perform vulnerability assessment, produce vulnerability maps which will include damages and loss of life estimates and to test flood management options;
12. Established Participatory Geographical Information Systems (PGIS) approach and implement as a means of integrating local community information into the assessments of the problem and the formulation of the solution and to strengthen involvement of communities or marginalized groups in decision-making. PGIS will be a tool included in the GIS-based socio-economics tool (or a separate tool to be used alongside it);
13. Support to hydrology and hydraulic modelling tasks ;
14. In cooperation with hydrology and hydraulic experts introduce advanced tools and methods in FRM that are scientifically sound and evidence-based.

Required Skills and Experience:

- University degree in Computer Science or other technical faculty or GIS related field. An advanced degree would be an advantage
- The candidate should have good understanding of developments of WIS, especially related to flood risk management
- Proven strong analytical abilities;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- A pro-active approach to problem-solving;
- Fluency in English language;
- Five or more years of relevant experience in water information system management
- Good knowledge of Water Information System structure in BiH.
- Experience in GIS data base management
- Good and proven experience in various software usage (ESRI products and at least one open source GIS);
- Knowledge and understanding of relevant water management requirements in field of spatial data usage and management;
- Good knowledge and understanding of river hydraulic software and their linkage to GIS
- Experience in DEM modelling;
- Excellent knowledge of English language.

Lead Agricultural/Agro Forestry expert

Major Deliverables for the expert:

1. Prepared detailed floodplain agro-forestry study which determine species of plants are appropriate for VRB and investigate floodplain and hillslope agro-forestry approaches that will be appropriate and design an agro-forestation scheme to be implemented on 840 hectares of floodplain and develop an implementation plan for the scheme;
2. Provided farm level training in more flood-resilient agricultural methods;

He/she will be involved with other technical experts in:

3. Prepared farm-level exposure and flood risk assessment for all agricultural land to fully characterise the exposure of agriculture to flood risk and develop a farm level flood risk

management strategies for the VRB to include: Crop diversification, Crop yield insurance strategy, and forward contracting strategy;

4. Prepared report on flood risks to agricultural infrastructure, as well as flood risk management opportunities associated with agricultural infrastructure under climate change and potential new infrastructure such as irrigation retention basins that could also serve as flood storage areas;

Required Skills and Experience:

- University degree in the field of agriculture, forestry, environmental sciences, natural resource management, or other related field
- The candidate should have good understanding of developments policy document preparation in the field of agriculture and forestry and their relation to water management, especially in flood risk management aspect;
- Proven strong analytical abilities;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Excellent writing, presentation/public speaking skills;
- A pro-active approach to problem-solving;
- Basic IT literacy;
- Fluency in English language;
- Ten or more years of relevant experience of sustainable agriculture and / or forestry preferably related to flood risk management;
- Excellent knowledge of administrative organization of BIH and division of responsibilities among various administrative levels in agricultural and forestry sectors;
- Knowledge on and previous experience and capacity for interactive participatory communication and cooperation with stakeholders, facilitating their involvement in Project activities;
- Experience in agricultural, forestry and water sectoral strategic documents and their linkage to spatial planning).

Lead Flood Forecasting and Early Warning Expert

Major Deliverables for the expert (along with the Lead expert) are:

1. Report discussing the availability (and gaps), quality and characteristics of data required for FFEWS. Identification of any short-term or long-term data collection needs;
2. Drafted key elements of FFEWS Community Communication strategy;
3. Prepare training plan for training to be provided to operators of the community-based EWS's
4. Training plan evidence of, and report on training provided to 13 municipalities, on their roles and responsibilities during flood emergency procedures;
5. Evidence of, and report on training provided to first and second responders on flood emergency response procedures;
6. Report on the review of existing FFEWS systems in BiH;
7. Report on catchment hydrological studies undertaken in the design of the FFEWS system
8. Prepared TOR of the fully-integrated FFEWS for VRB;
9. Report detailing inputs to telecommunications specification for the FFEWS;
10. Detailed Specification for input to procurement documents for all equipment required for FFEWS;
11. Report on existing institutional arrangements for FFEWS in VRB and BiH;

12. Detailed scope and for FFEWS modeling and software system and detailed design and specification of the system;
13. Fully implemented FFEWS system;
14. Evidence of, and report on training provided to operators and practitioners of the community-based EWS's;
15. Guidance document on the design and implementation of the FFEWS system;

Required Skills and Experience:

- Minimum - Master's degree in environmental sciences/engineering, geography, physics, hydro-meteorology, disaster risk reduction or other related fields;
- Good understanding of developments in GIS;
- The candidate should have excellent understanding of Flood risk assessment and Flood Forecasting;
- Proven strong analytical abilities;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Excellent writing, presentation/public speaking skills;
- A proactive approach to problem-solving;
- IT literacy;
- Fluency in English language;
- Minimum 10 (ten) years of professional experience in environmental sciences/engineering, geography, hydro-meteorology, disaster risk reduction or other related fields;
- International professional experience in Flood Forecasting Early Warning Systems design and/or implementation - at least 2 (two) years or 2 similar international projects;
- Experience in hydrometric monitoring and knowledge of telecommunications systems for early warning systems;
- Extensive experience in Flood Forecasting Early Warning Systems issues
- Experience in Balkans region is preferable;
- Experience in Early Warning Systems implementation, organisation, operation, command and execution.

Lead Hydraulic Modeller

Major Deliverables for the expert:

1. Adding climate risk management and flood risk management sessions to the trainings;
2. Establishment of numerical (hydrological and) hydraulic models of the Vrbas basin; production of high resolution flood hazard inundation maps; Maps are to be produced for a number of different return periods and for a range of climate change scenarios;
3. Provision of training in (hydrological and) hydraulic modelling to 15 practitioners at national and local government level and identification of long-term training needs;
4. Introduction of advanced tools and methods in FRM that are scientifically sound and evidence-based;
5. Training plans for Modelling, related to climate-induced flood risk assessment and management, and consolidation into an overall national capacity development plan;
6. Developed long list of structural and non-structural options;
7. Developed short list of options. Summarized impacts in an Appraisal Summary Table;
8. Training during the project;
9. Technical and non-technical guidance documents for all studies and assessments undertaken as part of the project;

10. Feasibility outline and detailed design studies for each preferred option/flood alleviation scheme (structural and non-structural). Detailed design of non-structural measures to be implemented;

Required Skills and Experience:

- Minimum - Master's degree in civil/hydraulic engineering or hydroinformatics (computational hydraulics)
- The candidate should have excellent understanding of developments in international flood hydrodynamic modelling;
- Proven strong analytical abilities;
- GIS data management abilities;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Excellent writing, presentation/public speaking skills;
- A proactive approach to problem-solving;
- IT literacy;
- Fluency in English language;
- Minimum 10 (ten) years of professional experience in hydraulic engineering and hydroinformatics;
- He/she should have international professional experience in hydraulic engineering and hydroinformatics projects - at least 2 (two) years or 2 similar international projects;
- Extensive experience of a variety of (open channel) hydraulic modelling software;
- Experience in flood-related projects;
- Experience in Balkans region is preferable.

Lead Hydraulic Structures Engineer

Major Deliverables for the expert:

1. Adding climate risk management and flood risk management sessions to the trainings;
2. Assessment and identification of flood risks to agricultural infrastructure, as well as flood risk management opportunities associated with agricultural infrastructure under climate change and finalise. Identification of potential new infrastructure such as irrigation retention basins that could also serve as flood storage areas;
3. Training plans for Hydraulic Structures, related to climate-induced flood risk assessment and management, and consolidation into an overall national capacity development plan;
4. Installation of Hydrometric network equipment;
5. Options assessment: The hydraulic impacts of the short-listed options to be simulated using the models developed for this study. An initial appraisal of the short-listed options to be carried out to determine technical performance in terms of flood damages reduction with and without intervention;
6. Training during the project;
7. Technical and non-technical guidance documents for all studies and assessments undertaken as part of the project;
8. Capital costs Outline of the options;
9. Feasibility outline and detailed design studies for each preferred option/flood alleviation scheme (structural and non-structural). Cost and quantity estimates of each finalized non-structural option to be carried out based on locally acquired cost data;
10. Detailed design of non-structural measures to be implemented.

Required Skills and Experience:

- Minimum - Master's degree in civil/hydraulic engineering;
- The candidate should have excellent skills in various project phases of design of hydraulic structures and river engineering measures;
- Good understanding of developments in hydraulic engineering and river engineering components of flood hydrodynamic modelling;
- Proven strong analytical abilities;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Excellent writing, presentation/public speaking skills;
- A proactive approach to problem-solving;
- IT literacy;
- Fluency in English language;
- Minimum 10 (ten) years of professional experience in hydraulic engineering and river engineering;
- He/she should have professional experience in hydraulic engineering and river engineering projects - at least 2 (two) years or 2 similar projects;
- Experience in flood-related projects, design of river training works and hydraulic structures
- Experience of a variety of (open channel) hydraulic modelling software;
- Experience in Balkans region is preferable

Lead Hydrologist

Major Deliverables for the expert:

1. Review the existing coverage, physical condition and data collection procedure including the quality of data. Data Collection;
2. Adding climate risk management and flood risk management sessions to the trainings;
3. Establishment of numerical **hydrological** (and hydraulic) models of the Vrbas basin; production of high resolution flood hazard inundation maps; Maps are to be produced for a number of different return periods and for a range of climate change scenarios;
4. Provision of training in **hydrological** (and hydraulic) modelling to 15 practitioners at national and local government level and identification of long-term training needs;
5. Policies that will protect against the impacts of flood risk including incorporating climate change flood resilience into construction and building codes for properties in the floodplain;
6. Introduction of advanced tools and methods in FRM that are scientifically sound and evidence-based;
7. Training plans for Hydrology, related to climate-induced flood risk assessment and management, and consolidation into an overall national capacity development plan;
8. Developed long list of structural and non-structural options;
9. Developed short list of options. Summarized impacts in an Appraisal Summary Table;
10. Training during the project;
11. Technical and non-technical guidance documents for all studies and assessments undertaken as part of the project;
12. Feasibility outline and detailed design studies for each preferred option/flood alleviation scheme (structural and non-structural).
13. Detailed design of non-structural measures to be implemented.

Required Skills and Experience:

- Minimum - Master's degree in civil/hydraulic engineering or Hydrology
- The candidate should have good understanding of developments in international water resources management and hydrologic component of flood hydrodynamic modelling;
- Proven strong analytical abilities;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Excellent writing, presentation/public speaking skills;
- A proactive approach to problem-solving;
- IT literacy;
- Fluency in English language;
- Minimum 10 (ten) years of professional experience in hydrology and water resources management;
- He/she should have international professional experience in hydrology and Integrated river basin modelling and management projects - at least 2 (two) years or 2 similar projects; Extensive experience of hydrology modelling software;
- Experience in flood-related projects
- Experience in Balkans region is preferable.

Lead Hydrometry Expert

Major Deliverables for the expert:

1. Review the existing central hydrometric database and assessment of the need to acquire or develop a centralised hydrometric database. Establish a quality control and assurance system set up to ensure data quality;
2. Review the existing coverage, physical condition and data collection procedure including the quality of data. Data Collection;
3. Assessment of the monitoring network requirements for effective monitoring for strategic flood risk management, flood forecasting and early warning in the future and optimise the stations coverage;
4. Detailed Specification, purchase and installation of equipment required for community-based schemes and establishment of community-based Early Warning systems for VRB;
5. Assessment of the institutional arrangements for the operation and maintenance of the hydromet stations and suggest manpower and financial requirements, and training needs, for the efficient O&M of all the stations. Assessment existing roles and responsibilities and the capacity of staff responsible for operating and maintaining the hydrometric network. Assessment the existing protocols for the collection, transmission, sharing, storage, management and use of the observed data;
6. Provision of detailed specification and design including costs of all equipment and each component of the hydrometric network specified including the detailed design and bid document for the stations for future rehabilitation / new installation;
7. Provide technical and financial assistance to improve hydrometric monitoring network (undertake procurement of equipment;
8. Preparation of an operational plan for the hydrometric network including transmission of data, data management, data analysis and reporting procedures;
9. Installation of Hydrometric network equipment;
10. Identification of resourcing, and training needs as well as institutional arrangements for the management of the proposed new hydrometric network. Provision of training for hydrometric staff in the O&M of up-graded hydrometric stations;

11. Installation of monitoring equipment for community EWS, with the assistance of community where possible;
12. **Input** for training in the operation of EWS;
13. **Input** for Training for community EWS operators and practitioners on community-based EWS;
14. Adding climate risk management and flood risk management sessions to the trainings;
15. Training plans for Hydrometry, related to climate-induced flood risk assessment and management, and consolidation into an overall national capacity development plan;
16. **Input** for Training during the project;
17. **Input** for Technical and non-technical guidance documents for all studies and assessments undertaken as part of the project;

Required Skills and Experience:

- Minimum - Master's degree in civil/hydraulic engineering or Hydrology
- The candidate should have good understanding of developments in hydrometric data acquisition using modern measuring equipment;
- GIS data management abilities;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Excellent writing, presentation/public speaking skills;
- A proactive approach to problem-solving;
- IT literacy;
- Fluency in English language;
- Minimum 10 (ten) years of professional experience in hydrometry and hydrology; Extensive experience of a variety of water measuring techniques and equipment;
- He/she should have international professional experience – at least 2 (two) years or 2 similar projects;
- Experience in flood-related projects
- Experience in Balkans region is preferable.

Lead Institutional Capacity Development Expert

Major Deliverables for the expert:

1. Review the existing coverage, physical condition and data collection procedure including the quality of data;
2. Assessment of national and local in order to identify gaps. Institutional capacity building plan delivery;
3. Examining of the feasibility of establishing a University MSc. course in CR-FRM at local University;
4. Assessment of current institutional arrangements and capacity for flood forecasting, flood emergency response and develop an institutional Arrangement plan for FFEWS;
5. Development and implementation of a capacity building roadmap for national and regional authorities as part of the decision-making process for granting planning permission;
6. Adding climate risk management and flood risk management sessions to the trainings;
7. Training plans for Institutional Capacity Development, related to climate-induced flood risk assessment and management, and consolidation into an overall national capacity development plan;
8. **Input** for Training during the project;
9. **Input** for Technical and non-technical guidance documents for all studies and assessments undertaken as part of the project;

Required Skills and Experience:

- Minimum - Master's degree in a relevant institutional and public policy discipline;
- He/she should have strong communication and analytical skills and be familiar with regulations and policies in BiH related to natural resources management;
- Excellent knowledge of institutional strengthening and capacity building practices;
- Proven strong analytical abilities;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Excellent writing, presentation/public speaking skills;
- A proactive approach to problem-solving;
- IT literacy;
- Fluency in English language;
- Minimum **10 (ten) years** of professional experience river basin management and flood protection institutions / and organization designing, development, analysis and evaluation;
- He/she should have international professional experience in institutional capacity development - at least **2 (two) years** or **2 similar** international **projects**;
- Strong skills in building teamwork;
- Chartership/accreditation with relevant institution will be desirable;
- Experience in Balkans region is preferable.

Lead legal/policy expert

Major Deliverables for the expert:

1. Report reviewing the strategies, plans, policies and legislative framework of all sectors relevant to water and flood risk management (forestry, energy, water management, agriculture) and detailing Identified entry points for introducing Climate Change considerations into at least two policies and plans. Report should elaborate current practice and deficiencies with respect to FRM;
2. Report reviewing the existing spatial planning legislation and policies for zoning development and economic activities away from high risk areas;
3. Chair quarterly inter-agency working group meetings to discuss the current policy and legislative framework for FRM and to formulate amendments to address deficiencies and develop new policy and legislative framework;
4. Report presenting the finalised consultation with sector leaders on findings and elaborated comments on recommendation of the established inter-agency working group as well as stakeholders who will be impacted by the changes;
5. Develop and finalize robust sector policies frameworks and guidelines to incorporate climate change including any necessary enabling guidelines and/or tools for effective implementation of new policies;
6. Publication of finalised sector policies and guidelines;

Required Skills and Experience:

- University degree in law or relevant field;
- The candidate should have good understanding of developments in international legal and policy document preparation;
- Proven strong analytical abilities;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Excellent writing, presentation/public speaking skills;
- A pro-active approach to problem-solving;

- Basic IT literacy;
- Fluency in English language;
- Ten or more years of relevant experience in water legislation and policy documents preparation, implementation of water related directives, especially WFD, Flood;
- Knowledge on and previous experience and capacity for interactive participatory communication and cooperation with stakeholders, facilitating their involvement in Project activities
- Good knowledge and understanding of the governance structure of BiH

Lead Socio/Environmental Economist/Flood Insurance Expert

Major Deliverables for the expert:

1. Prepared an impact assessment of the proposed new legislation and policy to determine and quantify effects on distribution of population and demographics within the floodplain, projected distribution of economic activity, and benefits to protection from climatic extremes, benefits of environmental protection and benefits and economic growth that will result from improved water supply;
2. Developed and codified methods and tools for undertaking socio-economic surveys to collection necessary information to fully map the socio-economic conditions of the rural poor, returnees and displaced person within the catchment;
3. Prepared detailed socio-economic surveys for VRB;
4. Prepared socio-economic and vulnerability assessment to fully map existing vulnerability within the VRB and identified the most appropriate adaptation options to reduce vulnerability within the Vrbas basin;
5. Developed tools, methods, guidelines and procedures for recording flood events, undertook post-event surveys and assessed vulnerability to flooding as well as assessed the effectiveness of flood mitigation measures in reducing vulnerability and damages;
6. Prepared feasibility studies into an index-based flood insurance scheme for VRB and design and implement pilot Index-flood insurance scheme in 13 municipalities.

Participation with other technical experts:

7. Developed GIS-based tool to integrate various spatial socio-economic data with the flood hazard maps, perform vulnerability assessment, produce vulnerability maps which will include damages and loss of life estimates and to test flood management options;
8. Prepared report on farm-level exposure and flood risk assessment for all agricultural land to fully characterise the exposure of agriculture to flood risk and develop a farm level flood risk management strategies for the VRB to include: Crop diversification, Crop yield insurance strategy, and forward contracting strategy;
9. Prepared the short-listed options in terms of flood damages reduction with and without intervention;
10. Outlined capital costs of the developed options and options benefits (in terms of flood damages reduction) to derive benefit-cost ratios and identify the socio-economically preferred option(s) for each municipality;
11. Report on obtained feedback from the stakeholder consultation processes to refine the preferred option(s) and re-assess the technical and socio-economic performance of the option(s) ;
12. Outlined and detailed design studies will need to be carried out on each preferred option/flood alleviation scheme (structural and non-structural);
13. Prepared cost and quantity estimates of each finalized non-structural option will be carried out based on locally acquired cost data; (

14. Prepared detailed design of non-structural measures to be implemented;
15. Prepared report on extensive community surveys to help characterise the socio-economic status of the communities and to hear first-hand, what their issues are and what they would like to see as the solutions;
16. Identified and reviewed existing community-based programs of relevance and identify entry points into existing community-based schemes (e.g. through Water Users Associations) ;
17. Established Participatory Geographical Information Systems (PGIS) approach and implement as a means of integrating local community information into the assessments of the problem and the formulation of the solution and to strengthen involvement of communities or marginalized groups in decision making. PGIS will be a tool included in the GIS-based socio-economic tool (or a separate tool to be used alongside it);
18. Developed Community Communications strategy for FFEWS;
19. Established and implemented employee-guarantee schemes for implementation of community-based flood risk management targeting 200 employees in each target municipality;

Required Skills and Experience:

- University degree in environmental economics, environmental sciences or other related field;
- Excellent knowledge of administrative organization of BIH and division of responsibilities among various administrative levels;
- Knowledge on and previous experience and capacity for interactive participatory communication and cooperation with stakeholders, facilitating their involvement in Project activities;
- Good and proven experience in dealing with governments and local authorities and their involvement in Project activities;
- Excellent skills in the use of computers, especially in database statistical analysis
- Excellent knowledge of English language;
- Ten or more years of relevant experience in socio-economic impact analysis for flood risk management projects;
- The international consultant's experience in financial instruments, property and flood insurance;
- Previous experience and capacity for interactive participatory communication and cooperation with stakeholders, facilitating their involvement in Project activities;

Lead Telecommunications Expert

Major Deliverables for the expert:

1. Assess the existing telecommunications infrastructure (telemetric and automated stations) ;
2. Develop the ToR for a full FFEWS for Vrbas Basin ;
3. Undertake telecommunications studies to determine the requirements to support monitoring and telemetry system as well as warning dissemination system ;
4. Assist to Lead hydrometry expert to optimize the number of station required for the basin monitoring ;
5. Assist to design of community-based schemes for the 3 pilot basins in consultation with local community ;

Required Skills and Experience:

- University degree in Electrical engineering or equivalent technical faculty. An advanced degree would be an advantage;
- Experience in designing communication protocols for flood risk management (radio, satellite and mobile/cellular technologies), primarily real time monitoring and emergency communications.
- Proven strong analytical abilities;
- Ability to work under pressure with several tasks and various deadlines;

- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- A pro-active approach to problem-solving;
- Knowledge and understanding of water management requirements in field of EWS communication and technologies;
- Excellent computer skills;
- Excellent knowledge of English language.

Local Flood Forecasting and Early Warning Expert

Major Deliverables for the expert (along with the Lead expert) are:

1. Review any existing flood forecasting systems, or elements of FFEWS in BiH;
2. ToR for a full FFEWS for VRB to inform the identification and development of appropriate locations for community-based early warning systems;
3. Detailed Specification of equipment required for community-based schemes for the 3 pilot basins, Purchase of equipment to be installed and Establishment of community-based Early Warning systems for VRB;
4. Consultation on the proposed EWS and in particular consultation with communities on proposed community-based EWS schemes;
5. Community Communications strategy for FFEWS;
6. Assessment of current institutional arrangements and capacity for flood forecasting, flood emergency response and develop an institutional Arrangement plan for FFEWS;
7. Identification of the requirement for flood forecasting model and development of the scope for and implement flood forecasting models, for a fully integrated FFEWS;
8. Installation of monitoring equipment for community EWS, with the assistance of community where possible;
9. Design and implementation of fully-integrated FFEWS (centralised and community-based);
10. Training for community EWS operators and practitioners on community-based EWS;
11. Early warning awareness and training workshops for community, NGOs, government and media representatives;
12. Produce guidance for the development of a flood forecasting and early warning system;
13. Municipal-level flood response and preparedness plans prepared and implemented;
14. Training in the operation of EWS where community-based EWS will be established;
15. Training for communities within the 13 municipalities, on roles and responsibilities during flood emergency procedures;
16. Training for first and second responders for flood emergencies – including drills and role play exercises;
17. Adding climate risk management and flood risk management sessions to the trainings;
18. Training plans for FFEWS, related to climate-induced flood risk assessment and management, and consolidation into an overall national capacity development plan;
19. Training during the project;
20. Technical and non-technical guidance documents for all studies and assessments undertaken as part of the project.

Required Skills and Experience:

- Minimum - Bachelor's degree (dipl.ing.) in environmental sciences/engineering, geography, physics, hydro-meteorology, disaster risk reduction or other related fields

- The candidate should have understanding of Flood risk assessment and Flood Forecasting Early Warning Systems implementation, organisation, operation, command and execution;
- Understanding of developments in climate change forecasting/modelling and GIS;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Reasonable writing, presentation/public speaking skills;
- A proactive approach to problem-solving;
- IT literacy;
- Reasonable conduct in English language;
- Minimum 8 (eight) years of professional experience in environmental sciences/engineering, geography, hydro-meteorology, disaster risk reduction or other related fields;
- Experience in Flood Forecasting Early Warning Systems issues;
- Some experience in GIS.

Local Hydraulic Modeller

Major Deliverables for the expert (along with the Lead expert) are:

1. Establishment of numerical (hydrological and) **hydraulic** models of the Vrbas basin; production of high resolution flood hazard inundation maps; Maps are to be produced for a number of different return periods and for a range of climate change scenarios;
2. Provision of training in (hydrological and) **hydraulic** modelling to 15 practitioners at national and local government level and identification of long-term training needs;
3. Introduction of advanced tools and methods in FRM that are scientifically sound and evidence-based;
4. Developed long list of structural and non-structural options;
5. Developed short list of options. Summarized impacts in an Appraisal Summary Table;
6. Feasibility outline and detailed design studies for each preferred option/flood alleviation scheme (structural and non-structural);
7. Detailed design of non-structural measures to be implemented ;
8. Adding climate risk management and flood risk management sessions to the trainings;
9. Training plans for Modelling, related to climate-induced flood risk assessment and management, and consolidation into an overall national capacity development plan;
10. Training during the project;
11. Technical and non-technical guidance documents for all studies and assessments undertaken as part of the project;

Required Skills and Experience:

- Minimum - Bachelor's degree (dipl.ing.) in civil/hydraulic engineering or hydroinformatics (computational hydraulics)
- The candidate should have good understanding of developments in international flood hydrodynamic modelling;
- Analytical abilities;
- GIS data management abilities;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Reasonable writing, presentation/public speaking skills;
- A proactive approach to problem-solving;
- IT literacy;
- Reasonable conduct in English language;
- Minimum 8 (eight) years of professional experience in hydraulic engineering and

hydroinformatics;
- Experience of a variety of (open channel) hydraulic modelling software;
- Experience in flood-related projects.

Local Hydraulic Structures Engineer

Major Deliverables for the expert (along with the Lead expert):

1. Options assessment: The hydraulic impacts of the short-listed options to be simulated using the models developed for this study. An initial appraisal of the short-listed options to be carried out to determine technical performance in terms of flood damages reduction with and without intervention;
2. Capital costs Outline of the options;
3. Feasibility outline and detailed design studies for each preferred option/flood alleviation scheme (structural and non-structural).;
4. Cost and quantity estimates of each finalized non-structural option to be carried out based on locally acquired cost data;
5. Detailed design of non-structural measures to be implemented;
6. Training during the project;
7. Technical and non-technical guidance documents for all studies and assessments undertaken as part of the project;

Required Skills and Experience:

- Minimum - Bachelor's degree (dipl.ing.) in civil/hydraulic engineering;
- The candidate should have skills in various project phases of design of hydraulic structures and river engineering measures;
- Understanding of developments in international hydraulic engineering and river engineering components of flood hydrodynamic modelling;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Reasonable writing, presentation/public speaking skills;
- A proactive approach to problem-solving;
- IT literacy;
- Reasonable conduct in English language;
- Minimum **8 (eight) years** of professional experience in hydraulic engineering and river engineering;
- Experience in flood-related projects, river training and hydraulic structures.

Local Hydrologist

Major Deliverables for the expert (along with the Lead expert) are:

1. Review the existing coverage, physical condition and data collection procedure including the quality of data. Data Collection;
2. Establishment of numerical **hydrological** (and hydraulic) models of the Vrbas basin; production of high resolution flood hazard inundation maps; Maps are to be produced for a number of different return periods and for a range of climate change scenarios;
3. Provision of training in **hydrological** (and hydraulic) modelling to 15 practitioners at national and local government level and identification of long-term training needs;
4. Policies that will protect against the impacts of flood risk including incorporating climate change flood resilience into construction and building codes for properties in the floodplain;
5. Introduction of advanced tools and methods in FRM that are scientifically sound and evidence-based;

6. Developed long list of structural and non-structural options;
7. Developed short list of options. Summarized impacts in an Appraisal Summary Table;
8. Feasibility outline and detailed design studies for each preferred option/flood alleviation scheme (structural and non-structural);
9. Detailed design of non-structural measures to be implemented;
10. Adding climate risk management and flood risk management sessions to the trainings;
11. Training plans for Hydrology, related to climate-induced flood risk assessment and management, and consolidation into an overall national capacity development plan;
12. Training during the project;
13. Technical and non-technical guidance documents for all studies and assessments undertaken as part of the project;

Required Skills and Experience:

- Minimum - Bachelor's degree (dipl.ing.) in civil/hydraulic engineering or Hydrology
- The candidate should have good understanding of developments in water resources management and hydrologic component of flood hydrodynamic modelling;
- Analytical abilities;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Reasonable writing, presentation/public speaking skills;
- A proactive approach to problem-solving;
- IT literacy;
- Reasonable conduct in English language;
- Minimum **8 (**eight) years of professional experience in hydrology and water resources management;
- Experience in flood-related projects.

Local Hydrometry Expert

Major Deliverables for the expert (along with the Lead expert) are:

1. Review the existing central hydrometric database and assessment of the need to acquire or develop a centralised hydrometric database. Establish a quality control and assurance system set up to ensure data quality;
2. Review the existing coverage, physical condition and data collection procedure including the quality of data. Data Collection;
3. Assessment of the monitoring network requirements for effective monitoring for strategic flood risk management, flood forecasting and early warning in the future and optimise the stations coverage;
4. Detailed Specification of equipment required for community-based schemes, Purchase of equipment to be installed and Establishment of community-based Early Warning systems for VRB;
5. Assessment of the institutional arrangements for the operation and maintenance of the hydromet stations and suggest manpower and financial requirements, and training needs, for the efficient O&M of all the stations. Assessment existing roles and responsibilities and the capacity of staff responsible for operating and maintaining the hydrometric network. Assessment the existing protocols for the collection, transmission, sharing, storage, management and use of the observed data;
6. Provision of detailed specification and design including costs of all equipment and each component of the hydrometric network specified including the detailed design and bid document for the stations for future rehabilitation / new installation;

7. Provide technical and financial assistance to improve hydrometric monitoring network (undertake procurement of equipment;
8. Preparation of an operational plan for the hydrometric network including transmission of data, data management, data analysis and reporting procedures;
9. Installation of Hydrometric network equipment;
10. Identification of resourcing, and training needs as well as institutional arrangements for the management of the proposed new hydrometric network. Provision of training for hydrometric staff in the O&M of up-graded hydrometric stations;
11. Installation of monitoring equipment for community EWS, with the assistance of community where possible;
12. **Input** for training in the operation of EWS ;
13. **Input** for Training for community EWS operators and practitioners on community-based EWS;
14. Adding climate risk management and flood risk management sessions to the trainings;
15. Training plans for Hydrometry, related to climate-induced flood risk assessment and management, and consolidation into an overall national capacity development plan;
16. **Input** for Training during the project;
17. **Input** for Technical and non-technical guidance documents for all studies and assessments undertaken as part of the project;

Required Skills and Experience:

- Minimum - Bachelor's degree (dipl.ing.) in civil/hydraulic engineering or Hydrology;
- The candidate should have good understanding of developments in hydrometric data acquisition using modern measuring equipment;
- GIS data management abilities;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Reasonable writing, presentation/public speaking skills;
- A proactive approach to problem-solving;
- IT literacy;
- Reasonable conduct in English language;
- Minimum **8 (eight) years** of professional experience in hydrometry and hydrology; Experience of a variety of water measuring techniques and equipment;
- Experience in flood-related projects.

Local legal/policy expert

Major Deliverables for the expert:

1. Local legal/policy expert is expected to work with Lead legal/policy expert on preparation of all mayor deliverables;
2. Identified entry points in the policies and plans for introducing Climate Change considerations;
3. Outlined the current policy framework relating to water and flood risk management in BiH elaborated current practice and deficiencies with respect to FRM;
4. Finalised consultation with sector leaders on findings and elaborated comments on recommendation of the established inter-agency working group as well as stakeholders who will be impacted by the changes;
5. Develop and finalize robust sector policies frameworks and guidelines to incorporate climate change including any necessary enabling guidelines and/or tools for effective implementation of new policies;
6. Publication of finalised sector policies and guidelines;

7. Participate in preparation of detailed review of existing spatial planning legislation and policies for zoning development and economic activities away from high risk areas;

Required Skills and Experience:

- University degree in law or relevant field;
- The candidate should have good understanding of developments in international legal and policy document transpositions and implementation in BiH;
- Proven strong analytical abilities;
- Ability to work under pressure with several tasks and various deadlines;
- Actively generates creative, practical approaches and solutions to overcome challenging situations;
- Excellent writing, presentation/public speaking skills;
- A pro-active approach to problem-solving;
- Basic IT literacy;
- Fluency in English language;
- Ten or more years of relevant experience in water legislation and policy documents preparation, implementation of water related directives, especially WFD, Flood;
- Excellent knowledge and understanding of the governance structure of BiH
- Excellent knowledge of water related directives transposition and implementation in B&H legislation, strategic and policy preparation on all B&H administrative levels, especially those related to WFD, Flood risk managements;
- Good and proven experience in dealing with governments and local authorities and their involvement in Project activities;
- Knowledge and understanding of relevant International Conventions, and norms and standards relevant for water management in relation to BIH obligation fulfillment.

Local Socio/Environmental Economist/Flood Insurance Expert

Major Deliverables for the expert:

1. Prepared an impact assessment of the proposed new legislation and policy to determine and quantify effects on distribution of population and demographics within the floodplain, projected distribution of economic activity, and benefits to protection from climatic extremes, benefits of environmental protection and benefits and economic growth that will result from improved water supply;
2. Developed and codified methods and tools for undertaking socio-economic surveys to collection necessary information to fully map the socio-economic conditions of the rural poor, returnees and displaced person within the catchment;
3. Prepared detailed socio-economic surveys for VRB;
4. Prepared socio-economic and vulnerability assessment to fully map existing vulnerability within the VRB and identified the most appropriate adaptation options to reduce vulnerability within the Vrbas basin;
5. Developed tools, methods, guidelines and procedures for recording flood events, undertook post-event surveys and assessed vulnerability to flooding as well as assessed the effectiveness of flood mitigation measures in reducing vulnerability and damages;
6. Prepared feasibility studies into an index-based flood insurance scheme for VRB and design and implement pilot Index-flood insurance scheme in 13 municipalities;

In participation with other technical experts:

7. Developed GIS-based tool to integrate various spatial socio-economic data with the flood hazard maps, perform vulnerability assessment, produce vulnerability maps which will include damages and loss of life estimates and to test flood management options;

8. Prepared report on farm-level exposure and flood risk assessment for all agricultural land to fully characterise the exposure of agriculture to flood risk and develop a farm level flood risk management strategies for the VRB to include: Crop diversification, Crop yield insurance strategy, and forward contracting strategy;
9. Prepared the short-listed options in terms of flood damages reduction with and without intervention;
10. Outlined capital costs of the developed options and options benefits (in terms of flood damages reduction) to derive benefit-cost ratios and identify the socio-economically preferred option(s) for each municipality;
11. Report on obtained feedback from the stakeholder consultation processes to refine the preferred option(s) and re-assess the technical and socio-economic performance of the option(s);
12. Outlined and detailed design studies will need to be carried out on each preferred option/flood alleviation scheme (structural and non-structural);
13. Prepared cost and quantity estimates of each finalized non-structural option will be carried out based on locally acquired cost data;
14. Prepared detailed design of non-structural measures to be implemented;
15. Prepared report on extensive community surveys to help characterise the socio-economic status of the communities and to hear first-hand, what their issues are and what they would like to see as the solutions;
16. Identified and reviewed existing community-based programs of relevance and identify entry points into existing community-based schemes (e.g. through Water Users Associations);
17. Established Participatory Geographical Information Systems (PGIS) approach and implement as a means of integrating local community information into the assessments of the problem and the formulation of the solution and to strengthen involvement of communities or marginalized groups in decision making. PGIS will be a tool included in the GIS-based socio-economic tool (or a separate tool to be used alongside it);
18. Developed Community Communications strategy for FFEWS;
19. Established and implemented employee-guarantee schemes for implementation of community-based flood risk management targeting 200 employees in each target municipality;

Required Skills and Experience:

- University degree in environmental economics, environmental sciences or other related field
- Excellent knowledge of administrative organization of BIH and division of responsibilities among various administrative levels;
- Knowledge on and previous experience and capacity for interactive participatory communication and cooperation with stakeholders, facilitating their involvement in Project activities;
- Good and proven experience in dealing with governments and local authorities and their involvement in Project activities;
- Excellent skills in the use of computers, especially in database statistical analysis
- Excellent knowledge of English language;
- Five or more years of relevant experience in socio-economic impact analysis for flood risk management projects;
- Experience in financial instruments, property and flood insurance;
- Previous experience and capacity for interactive participatory communication and cooperation with stakeholders, facilitating their involvement in Project activities.

Local Stakeholder Engagement Specialist

Major Deliverables for the expert:

1. Report on engagement and involvement the community in the development of climate resilient adaptive measures that will meet their needs;

He/she will participate/contribute with other experts in:

2. Report on feedback from the stakeholder consultation processes to refine the preferred option(s) and re-assessment results on technical and socio-economic performance of the option(s);
3. Developed Community engagement, mobilization and sensitization plans;
4. Developed Community-specific Intervention plans with participation of the local communities;
5. Report on communities mobilisation in the implementation in intervention plans;
6. Report on established and implemented employee-guarantee schemes for implementation of community-based flood risk management targeting 200 employees in each target municipality;
7. Report on results of consultation on the proposed EWS and in particular consultation with communities on proposed community-based EWS schemes.

Required Skills and Experience:

- University degree in social sciences, sociology, development, socio-economy, natural resource management, an advanced degree would be an advantage
- Strong negotiations skills and networking abilities.
- Strong analytical, reporting and writing abilities.
- Proven communication and leadership skills.
- Excellent team player with good interpersonal skills.
- Ability to work under pressure and tight deadlines.
- Ability to accommodate additional demands at short notice.
- Ability to conduct research and analysis with strong synthesis skills;
- Highly developed inter-personal, negotiation and teamwork skills, networking atitude.
- Fluency in English language;
- University degree in social sciences, sociology, development, socio-economy, natural resource management, an advanced degree would be an advantage;
- Preferably 5 years experience with policy or institutional development/implementation/reform related to projects for water management, preferably flood risk aspect;
- Knowledge of national institutions, key stakeholders, development agencies, NGOs
- Experience with project development, implementation, or demonstrations at local, national and/or international levels involving stakeholders engagement and mobilization;
- Knowledge of national communities and Institutions is highly desirable; experience in similar previous role is a strong asset.

Annex 8. UNDP Strategic Plan: Key Focal Areas + Key result areas + Provisional Corporate Outcomes

The Technology transfer for climate resilient flood management in Vrbas River Basin project is aligned to UNDP's **Area of Work 1 - Sustainable development pathways** e.g. Effective risk management, under which UNDP assists programme countries to design and implement development pathways that can tackle the connected issues of poverty, inequality and exclusion while transforming productive capacities, avoiding the irreversible depletion of social and natural capital and lowering risks arising from shocks, as well as **Area of Work 3 – Resilience-building**, e.g. Disaster risk reduction, under which UNDP will help build resilience through better protection against economic and environmental shocks and will focus to provide much stronger ability to prepare for and deal with the consequences of natural disasters, especially as they are exacerbated by climate change.

- **Effective risk management** - Planning, policy frameworks and institutional capacities to substantially reinforce action on climate change**.** Actions will help with integrating low-emission, climate-resilient objectives into national and sectoral development plans and identifying priority mitigation and/or adaptation measures; reforms that reduce financial risk and offer improved incentives for adaptation and mitigation responses that can work over the medium to long term; implementation of measures to reduce vulnerability and increase adaptive capacity across affected sectors; and development of capacities to access (including through direct access), deliver, monitor, report on and verify the use of climate finances.
- **Disaster risk reduction** - Data, policies and capacities for comprehensive country level (and subregional and regional) action on natural disasters, to minimize adverse development impacts and accelerate rebuilding. This includes the support across a range of issues: disaster risk assessment looking, for example, at geophysical, weather/climatic and other hazards, including those that are low intensity but high frequency, as well as differentiated vulnerabilities by social and economic groups such as women, female-headed households and populations located in the poorest regions; policies and long-term planning and investment frameworks that are disaster risk-sensitive, integrate disaster risk reduction with adaptation to climate change and address differentiated social and economic impacts; and preparedness for disaster management and recovery at the sub-national and national levels, including innovation to manage risks through insurance and resilient infrastructure.

The project is in line with UNDP's Strategic Plan 2014 – 2017, and following outcomes:

- **UNDP Strategic Plan Primary Outcome 1** - Growth and development are inclusive and sustainable, incorporating productive capacities that create employment and livelihoods for the poor and excluded. UNDP Strategic Plan Output 1.4 Scaled up action on climate change adaptation and mitigation across sectors which is funded and implemented

- **UNDP Strategic Plan Primary Outcome 5** – Countries are able to reduce the likelihood of conflict and lower the risk of natural disasters, including from climate change. UNDP Strategic Plan Output 5.3 Gender responsive disaster and climate risk management is integrated in the development planning and budgetary frameworks of key sectors (e.g. water, agriculture, health and education), Output 5.4. Preparedness systems in place to effectively address the consequences of and response to natural hazards (e.g. geo-physical and climate related) and man-made crisis at all levels of government and community).

Annex 9. Assessment of the availability of the main socio-economic datasets required for flood risk vulnerability assessments

	Receptor	Damage/Loss Type	Primary, Secondary or Tertiary	Data availability, quality and currency
1	Buildings (traditional, permanent, semi-permanent and commercial	Tangible Direct	Primary	From the census of citizens
2	Building Contents	Tangible Direct	Primary	It is necessary to assess and analyse the vulnerability of building contents to floods.
3	Infrastructure (roads, railways, utilities)	Tangible Direct	Primary	Data on infrastructure vulnerability to floods are not available and additional assessment and analyses are required.
4	Crops/ Animals (subsistence/backyard, cash, mixed)	Tangible Direct	Primary	Data on crops and animals vulnerability are not available so the additional assessment and analyses are required.
5	Flood causes fire and damage	Tangible Direct	Secondary	Data on flood consequences in terms of fire and other consequences, primarily landslides, are available for previous floods.
6	Flood water contaminates land	Tangible Direct	Secondary	Data on flood consequences in terms of land pollution are available for previous events.
11	Disruption to agricultural production	Tangible Indirect	Primary	General data on agricultural production are available in municipalities and statistic institutes, while the data on vulnerability of agricultural production are not available
12	Disruption to Industrial production	Tangible Indirect	Primary and Secondary	General data on industrial production are available in municipalities and statistic institutes, while the data on vulnerability of industrial production are not available,
13	Loss of communications	Tangible Indirect	Primary	Data on flood impact to traffic are available for earlier floods, as well as data on total traffic in some routes where vehicle measuring devices are available. Data on traffic vulnerability to flood are not available
14	Disruption of Health and Education	Tangible Indirect	Primary	Data on flood impact to normal terms of work of educational and health institutions are available for earlier floods, as well as general data on number of educational and health institutions and their beneficiaries/users

15	Disruption of Utility Supplies	Tangible Indirect	Primary	Data on flood impact to utility services are available for earlier floods, as well as general data on number and quality of utility services in municipalities
16	Increased traffic congestion	Tangible Indirect	Secondary	Data on flood impact to increased traffic congestion are available for earlier floods form the reports of auto-motor clubs
17	Disruption of flow of employees to work	Tangible Indirect	Secondary	Data on number of employees per municipality are available while the population number per residential areas is not available. Overlapping of employees per residential areas and possible floods per residential areas would respond to this question
18	Contamination of water supplies	Tangible Indirect	Secondary	Data on flood consequences in terms of water pollution are available for earlier floods. Data on number of water sources and accumulations are also available in municipalities with additional assessment
19	Food and other shortages	Tangible Indirect	Secondary	No data available on lack of food and other commodities due to flood
20	Increased costs of emergency services (post flood recovery)	Tangible Indirect	Secondary	No data available on increased costs of emergency services
21	Loss of Income	Tangible Indirect	Secondary	No data available on loss of Income
22	Increased Household costs	Tangible Indirect	Secondary	No data available on increased household costs or earlier floods
23	Bankrupt Businesses	Tangible Indirect	Tertiary	For data defining the enterprises that would be liquidated or become bankrupt, additional assessments and analyses are needed.
24	Loss of exports	Tangible Indirect	Tertiary	For data defining the enterprises and scope of their inability to export product and services, additional assessments and analyses are needed.
25	Reduced GDP	Tangible Indirect	Tertiary	General GDP data are available per municipalities, while the data on flood impact to GDP are not available
26	Loss of Life, Injury	Intangible Direct	Primary	Data on loss of life due to floods are available for the floods that ended. Evaluation of flood impact to loss of life or injuries are not available

26	Loss of Heritage	Intangible	Primary	Data on loss of cultural-historical heritage due to floods are available for the floods that ended. In addition, the data on number and type of cultural historical heritage are also available. Evaluation of flood impact to destruction or damage of cultural historical heritage is not available
27	Increased stress and psychological trauma/suicide	Intangible	Secondary	No data available on increased stress and psychological trauma/suicide
28	Increased ill health etc.	Intangible	Secondary	Data on increased diseases caused by floods are available in the public health institutes, but the analyses should be made. Evaluation of flood impact to increase of diseases is not available
29	Homelessness	Intangible	Tertiary	Data on number of people who became homeless due to floods are available in municipalities and their departments.
30	Loss of Livelihood	Intangible	Tertiary	Data on impact to or loss of livelihoods are not available, so additional assessments and analyses are needed.
31	Loss of Possessions	Intangible	Tertiary	No data available on loss of possessions

Annex 10. Theory of Change

Expected Outcome	Output	Barrier	Barrier Type	Overall Risk Category	Risk Mitigation/Project approach/Steps to achieve output
Component 1 - Enabling environment for climate risk sensitive water and flood management					
Key relevant development strategies/policies/legislation integrate climate change-resilient flood management approaches	1.1 At least two priority sectoral policies and plans (e.g. agriculture, hydropower, water resources) updated to include climate change modeling results ;	1.1.1) A lack of a comprehensive strategic water and flood risk management policy and legislative framework to respond to climate change risks; Fragmentation and gaps in policies and national regulations for long-term flood risk management under climate change	Regulatory		1) Study CC impacts of all major sectors in the VRB;
		1.1.2) No account taken of flood risk in landuse management and spatial planning;	Regulatory		2) Develop methodologies for incorporating CC modelling results into risk assessments for two sectors;
		1.1.3) No account taken of CC and FR in sector plans and policies etc.;	Regulatory		3) Develop an approach for incorporating CC into two sector policies, plans, strategies;
		1.1.4) Lack of knowledge of CC and FR among policy makers	Regulatory		4) Standardise and codify approach to incorporating CC into sector policies, plans, strategies;
		1.1.5) No methodology for incorporating CC into sector plans and policies	Technical		4) Standardise and codify approach to incorporating CC into sector policies, plans, strategies;
					6) For two sectors, develop policies, plans and/or strategies which incorporate CC.
					7) enable active participatory approach (experts from relevant line-minitires and water agecnies) on development of sectoral policies;
	1.2. Floodplain management and spatial planning regulations and policies updated to include climate change risks (revision of land use regulations, stricter policy on construction permits in the areas prone to flooding, etc);	1.2.1)Policies, guidelines and enforcement capacity for effective implementation of existing spatial planning regulations not well developed in either FBiH or RS	Regulatory		1) Enhance spatial planning regulations by including CC in policies, plans, strategies;
		1.2.2) Existing spatial planning regulations do not include CC risks due to CC modelling results not being incorporated into spatial planning regulation	Technical		2) Enhance spatial planning regulations enforcement framework;
		1.2.3) Unplanned expansion of housing and economic activities onto floodplains (largely from poor and returnee communities)	Regulatory/Behavioural		3) Map socio-economics of vulnerable groups and ensure solutions are fully cognizant of their needs and fully participatory;
		1.2.4) Lack of adequate affordable housing in low risk areas	Financial/Institutional		4) build capacity and raise awareness of FR and CC resilient agricultural practices;
		1.2.5) Best and most fertile agricultural land on floodplain (soils enriched by flooding), but inadequate knowledge of flood resilient agricultural practices among subsistence farmers. Current approaches do not involve local communities	Technical		5) Develop CR agricultural measures that involve local communities in the assessment, development and implementation of the intervention measures;
					6) Build capacity, provide guidance and raise awareness of CC flood resilient construction measures
		1.2.7) Lack of knowledge of the risks (among policy makers and public end users) and vulnerabilities	Technical		7) timely approach (project initial phase) relevant line-ministiries on various governmental levels in BiH in regards to incorporating CC in spatial planning regulations
		1.2.8) Lack of knowledge of flood resilience measures in construction and lack of guidance in construction codes	Technical/Regulatory		8) create understanding within relevant line-ministiries on the importance of incorporating CC in spatial planning regulations
	1.3. Appropriate adaptation technology solutions for climate resilient	1.3.1) No 'body of work' currently available on climate change resilient Flood management for BiH	Institutional/Behavioural		1) To ensure codification, the project will develop guidance documents for all technologies transferred;
		1.3.2) No formal dissemination forum in BiH for CRFRM	Institutional/Behavioural		2) To ensure dissemination, the project will develop a capacity development plan as well as a training plan;

Component 2 - Technical and institutional capacity for transferring climate resilient flood management technologies and approaches					
Climate resilient flood risk management is enabled by transferring modern technologies and strengthening institutional capacities	2.1. Improved hydrological and hydrodynamic model for the VRB incorporating climate change predictions, developed to produce flood hazard inundation maps for spatial planning and emergency response planning, and for the long-term strategic flood risk management of the VRB;	2.1.1) Lack of appropriate hazard maps on which to base spatial planning, floodplain management policy and emergency response; Lack of interest among agencies and other stakeholders to produce flood hazard inundation maps for spatial planning and emergency response planning;	Technical		1) Introduction of modern flood modelling methods and software;
		2.1.2) Low capacity among national and regional government agency staff to undertake hazard mapping and risk assessment	Technical		2) Purchase and collection of relevant datasets for the Vrbas basin for flood hazard modelling;
		2.1.3) Lack of knowledge and implementation of modern flood hazard modelling tools	Technical		3) Codification of flood modelling methods and data collection approaches through the development of guidance documents for all aspects of flood hazard modelling and mapping to ensure systematic and consistent application of methods in the future;
		2.1.4) Lack of key data sets for development of flood hazard models, due to cost (e.g. Digital Elevation Models of the floodplain) and due to lack of systematic data collection capabilities within relevant government agencies	Technical/Financial		4) Identification of training gaps and development of capacity development plan;
		2.1.5) Lack of cooperation between FBiH and RS stakeholders to harmonise approaches for producing flood hazard maps based on a unified methodology	Institutional/behavioural		5) Provision of training to government agency staff
	2.2. GIS-based vulnerability, loss and damages assessment tool and database established and institutionalized to record, analyze, predict and assess hydro-meteorological and other hazard events and associated losses;	2.2.1) The socio-economic information required to assess flood damages, losses, exposure and vulnerability is not currently available and is not collected systematically.	Technical		1) Develop and codify methods and tools for undertaking socio-economic surveys to collection necessary information to fully map the socio-economic conditions of the rural poor, returnees and displaced person within the catchment;
		2.2.2) Existing procedures for collection of flood damages and losses, information currently carried out by the municipalities, varies in approach and quality of data from one municipality to the next.	Technical		2) Undertake socio-economic and vulnerability assessment to fully map existing vulnerability within the VRB; the and to identify the most appropriate adaptation options to reduce vulnerability within the Vrbas basin.
		2.2.3) Capacity of staff to undertaken vulnerability assessments and flood damages and losses assessment, is very low	Technical		3) Engage and involved the community in the development of climate resilient adaptive measures that will meet their needs ;
		2.2.4) There are currently no methods for gender disaggregation with respect to flood damages, losses and vulnerability information, where it exists	Technical		4) Develop a GIS-based tool to integrate various spatial socio-economic data with the flood hazard maps, perform vulnerability assessment, produce vulnerability maps which will include damages and loss of life estimates and to test flood management options;
					5) Develop tools, methods, guidelines and procedures for recording flood events, undertaking post-event surveys and assessing vulnerability to flooding as well as assessing the effectiveness of flood mitigation measures in reducing vulnerability and damages
	2.3. Hydro-meteorological monitoring system in the VRB upgraded (increased from 11 to 25 gauging stations) and	2.3.1) Since the breakup of Yugoslavia, deterioration of hydrometric stations (due to financial and technical constraints) has resulted in a hydrometric monitoring network which is outdated and inadequate, in terms of spatial and temporal coverage, for the purposes of strategic flood risk management and flood forecasting and early warning. 11 out of 36 stations are still operational and all on main rivers. Lack of resources means that tributaries which also are high flood risk areas (and which contribute to flooding on the main river) are not gauged	Financial/Technical		1) Undertake an assessment of the monitoring network requirements for effective monitoring for strategic flood risk management, flood forecasting and early warning in the future;
		2.3.2) The existing hydrometric network is currently owned and operated by disparate agencies/institutions (for example public electricity institutes in charge of HPP stations) and data collected is not centrally stored.	Institutional/Technical		2) Provide technical and financial assistance to improve hydrometric monitoring network;
		2.3.3) Due to financial constraints, historical data from the Soviet era, which is essential for developing flood hazard			

	2.3. Hydro-meteorological monitoring system in the VRB upgraded (increased from 11 to 25 gauging stations) and harmonized into a central hydrometric system;	2.3.1) Since the breakup of Yugoslavia, deterioration of hydrometric stations (due to financial and technical constraints) has resulted in a hydrometric monitoring network which is outdated and inadequate, in terms of spatial and temporal coverage, for the purposes of strategic flood risk management and flood forecasting and early warning. 11 out of 36 stations are still operational and all on main rivers. Lack of resources means that tributaries which also are high flood risk areas (and which contribute to flooding on the main river) are not gauged	Financial/Technical		1) Undertake an assessment of the monitoring network requirements for effective monitoring for strategic flood risk management, flood forecasting and early warning in the future;
		2.3.2) The existing hydrometric network is currently owned and operated by disparate agencies/institutions (for example public electricity institutes in charge of HPP stations) and data collected is not centrally stored.	Institutional/Technical		2) Provide technical and financial assistance to improve hydrometric monitoring network;
		2.3.3) Due to financial constraints, historical data from the Soviet era which is essential for developing flood hazard models, is in paper format, and therefore cannot be used with modern modelling tools and approaches.	Financial		3) Purchase and implement a centralised hydrometric database for Vrbas basin (and national hydrometric network);
		2.3.4) Limited capability among national and regional staff for undertaking the operation and maintenance of existing (old) hydrometric equipment and less capacity for operation and maintenance of state-of-the-art equipment	Technical		4) Review the existing institutional arrangements for data collection, storage and sharing and suggest new arrangements as necessary, to ensure effective and timely data sharing among relevant agencies;
					5) Digitise all paper format data for VRB and systematise and store within the new national hydrometric database;
					6) Establish guidelines, procedures, data sharing protocols and users manuals for the new hydrometric database;
					7) Training for hydrometric staff in the O&M of up-graded hydrometric stations
	2.4. Institutional capacity strengthening plan developed and targeted training on climate-induced flood risk management provided to at least 100 practitioners and decision-makers;	2.4.1) Professional institutions for water management are severely understaffed. In the Vrbas River catchment it is estimated that only 50% of water management positions are currently filled.	Technical		1) Add climate risk management and flood risk management sessions to the trainings provided by the existing DRR project;
		2.4.2) National and regional staff with responsibility for flood management and protection are lacking in advanced climate risk management planning and flood risk managment skills.	Technical		2) improve the technical capacity and knowledge base for climate risk management and a long term adaptation planning for flood risk management;
					3) Introduce advanced tools and methods to establish the process of planning that is scientifically sound and evidence-based;
					4) Examine the feasibility of establishing a University MSc. course in CR-FRM;
					5) Long-term national capacity plan to consider options such as the development of internships and voluntary schemes for University students, in CR-FRM;

Component 3 – Climate resilient flood management technologies for vulnerable communities in VRB					
New technologies and approaches for enhanced flood risk management applied to increase resilience of vulnerable communities in VRB	3.1. Integrated land use and flood risk management plan for the VRB developed and non-structural measures implemented by local communities (through Output 3.2.), government and/or private sector;	3.1.1) There is currently no strategic flood risk management approach in BiH which identifies the best combination of structural and non-structural measures to address climate induced flood risk.	Technical/Institutional		1) Development of a bottom-up, multi-stakeholder, consensus-based FRM plan for Vrbas Basin;
		3.1.2) Flood management currently focused on flood protection and rehabilitation works, the cost of which has doubled in the last decade. Existing flood protection structures are at the end of their design life, and are in a state of disrepair due to damage incurred in the war and a lack of funding for maintenance since then. However, there is a lack of knowledge of non-structural Flood risk management approaches	Financial/Institutional/Technical		2) Plan will include the detailed design of non-structural measures such as community afforestation scheme on the flood plains, establishment of locally controlled and managed flood zones, watershed rehabilitation works etc., incentives based FRM schemes (through municipal job creation or loan / insurance repayment schemes), Index-based flood insurance scheme;
		3.1.3) Currently no inclusion of Climate Change considerations in the design of conventional structural measures	Technical		3) Structural options will be develop alongside non-structural measures to identify the best combination;
		3.1.4) Currently limited expertise in the design and implementation of non-structural measures	Technical		4) The structural and non-structural options will be identified and developed using the flood model to assess feasibility, and develop solutions based on a detailed consideration of climate change scenarios;
		3.1.5) Current approach to FRM is limited in terms of inclusion of local communities, and particularly the vulnerable groups. Effectiveness of measures therefore limited due to low participation of target communities	Behavioural/Financial/Technical		5) Intervention measures will be prioritised based on vulnerability assessment to ensure highest vulnerability is addressed;
	3.2. Participatory community-based adaptation strategies, technologies and practices implemented in priority flood risk areas (e.g. community	3.2.1) Current conventional approaches to FRM do not engage with or include affected communities	Technical		1) The adaptation solutions will focus on transferring best available technologies for local level flood risk management;
		3.2.2) Vulnerable and poor communities lack the awareness of flood risk in their areas and the potential impacts that their activities have on flooding.	Technical		2) Extensive community surveys will be undertaken to help characterise the socio-economic status of the communities and to hear first-hand, what their issues are and what they would like to see as the solutions;
		3.2.3) Lack of interest among communities/identified vulnerable groups to participate	Institutional/Behavioural		3) Participatory such as Participatory Geographical Information Systems (PGIS) will be used as a means of integrating local community information into the assessments of the problem and the formulation of the solution and to strengthen involvement of communities or marginalized groups in decision making;
	3.3. Local communities (particularly women and refugees) trained to implement and maintain flood resilient non-structural intervention measures,	3.3.1) Local communities lack the awareness of adaptation strategies	Technical		1) Awareness-raising campaigns for flood-prone communities ;
		3.3.2) Lack of financial resources to fund training for local communities	Financial		2) Development of policies, methods and long-term practice of public participatory involvement in adaptive flood risk management in the Vrbas basin
		3.3.3) Lack of policy, and practice of using the local communities in FRM	Institutional/Regulatory		3) Interventions such as employment schemes for maintenance of flood defences, replanting of floodplain and hillslope vegetation and implementation of agro-forestry, and operation of a community-based flood monitoring and early warning system;
					4) Training of XX communities in flood resilient agriculture, operation of community EWS (gauge reading
	3.4. Early warning system in VRB modified to include the new hydrometric monitoring network as part of a fully-integrated flood forecasting system (comprised of centrally-based				
		nce Services 3.4.1) Flood forecasting and early warning - a key non-structural measure is poorly developed for the Vrbas basin. The existing flood forecasting and early warning system for			Page 149 1) The project will develop an integrated FFEWS system based on the upgraded hydrometric monitoring network and hydrological and hydraulic flood models. The EWS will include community-based EWS where appropriate with provision of

	3.4. Early warning system in VRB modified to include the new hydrometric monitoring network as part of a fully-integrated flood forecasting system (comprised of centrally-based and community-based early warning systems). Municipal-level flood response and preparedness plans prepared and implemented.	3.4.1) Flood forecasting and early warning - a key non-structural measure is poorly developed for the Vrbas basin. The existing flood forecasting and early warning system for the VRB is manually based, and relies on a inadequate hydrometric monitoring network.	Technical/Institutional/Regulatory		1) The project will develop an integrated FFEWS system based on the upgraded hydrometric monitoring network and hydrological and hydraulic flood models. The EWS will include community-based EWS where appropriate with provision of equipment and training to local communities

Annex 11. Analysis of existing sector-specific legislation, policies and plans

Spatial Planning

248. The state level Water Policy document was primarily intended to serve as a conceptual platform, agreed between key stakeholders in BiH, on what is to be achieved in the water sector development in BiH by 2035, while its goals, would be more precisely defined through the entity strategies or action plans for management of water resources and environment. Unfortunately the Water Policy document was never officially approved.

249. At entity level, spatial physical planning and water management strategies are particularly lacking inter-sectorial cooperation. While the FBiH Water Management Strategy recognizes the need for increased inter sectorial cooperation, in practice it is minimal. Despite the fact that sectoral legislation and principles cover inter- sectoral harmonization, the problem is the lack of good management practices and law enforcements. Laws and strategic documents cover the modus of communication and cooperation among entities, but there is no constitutional obligation for them to be mutually consistent and they are sometimes conflicting.

250. There is a lack of meaningful consultation and cooperation among relevant stakeholders in BiH, between two BiH entities, FBiH and RS, whose River watershed Agencies are implementing instructions from their respective governments. Hence they fail to have an integrated approach to their water legislation and regulation.

251. An important instrument for implementing a spatial planning strategy, is the permit system that translates, enables and enforces the specific provisions of the spatial/physical plan. The physical planning permit system is regulated, but in reality it is very time consuming. Deadlines for issuing permits are usually too long, and Water Agencies lack sufficient number of competent staff necessary for processing large numbers of permit requests.

252. The requirements and standards that are set within water permits need monitoring and enforcement. In BiH there are independent inspectorates that control compliance with the legislation and pursue law enforcement. However, the major weakness of the present inspectorates is rather low effectiveness and efficiency of their work, mainly due to the insufficient number and/or expertise of inspectors. There is no obligation on cooperation between entities inspectorates.

253. Flood management and protection system in FBiH is fragmented among existing administrative levels (entity, cantons, municipality) and division of responsibilities among them is not completely clear. Planning and implementation of flood prevention in FBiH is carried out without coordination of actions between various government levels. One of the reasons is the fragmented financing system, in which each governmental level determines priorities on its own. There is no constitutional obligation that it must be coordinated.

254. There is no harmonization of plans and programs at the river basin level in FBiH, but also at the whole BiH territory (as mentioned above, entities are not obliged to coordinate and harmonize their activities). Each administrative level uses different methodologies for planning of preventive flood protection measures and setting of priorities at the river basin level is not harmonized.

255. For example, sediment management in BiH is of utmost importance for flood management. However in its current form there are problems such as excessive gravel exploitation resulting in diversion of the mainstream of the river and increased erosion in the riverbed and inadequate maintenance of the riverbed results in creation of sandbanks. RS carried out in 2005 an expert review of the condition of the riverbanks and sand-banks, resulting in the proposal of potential gravel exploitation sites. In the FBiH the concession of the sediment is the responsibility of the Cantonal ministries, and in 2011 the Study for the possible locations is completed in only one canton. There is a lack of a comprehensive sediment management plan or program in any water planning document. In order to avoid the problems with overexploitation of river materials, spatial planning and water management plans should elaborate the basis for regulation of exploitation of river sediment, stressing that it can be done only on the basis of adequate technical documentation and is to be fully compliant with other river regulation plans.

Exploitation planning should be done only by the authorized professional institutions and technical documentation must undergo a complete adoption procedure.

256. A key aspect of spatial planning is the planning an construction of flood defences. Historically, flooding in Bosnia and Herzegovina was dealt with mainly by the construction of flood defences. Throughout BiH and in the Vrbas river basin, flood defences were severely damaged during the war and have remained in a poor state of repair due to limited budgets for maintenance of flood defences. Many structures now fail to meet their design standards of protection due to the increased magnitude and frequency of large flood events in the last 10 years. Few significant new flood defence structures have been built since 1998, with the exception of structures built in FBiH in the area of Gornji Vakuf-Uskoplje, Bugojno (1200 m of river bed regulation with new "river bed geometry", stabilization thresholds), Donji Vakuf (river flow regulation), Jajce (500m of Pliva river regulation with stabilisation elements). There is no comprehensive BiH strategy for the design of new flood defences, or the operation and maintenance of existing defences although the current state of flood protection in BiH has been assessed23. Some documents make mention of flood defences, such as 'Action plan for sustainable management of flood risks for Planning period 2010 - 2021 in Republic of Srpska', prepared by the Ministry of Agriculture, Forestry and Water Management in RS for Sava river basin in RS which mentions planned new flood protections systems (length 40 km) to protect 200,000 hectares of agricultural and construction land in Sava river basin from floods. The Water Management Strategy for Federation of BiH up to 2021' (adopted 2011) identifies the need for Reconstruction and rehabilitation of the existing and construction and maintenance of the system of protection facilities …. as one of its goals for reducing the risk at extreme hydrological phenomena. While these documents suggest that there will be development of flood defences in the future, there is no consideration of a strategic approach to flood risk management on the River basin scale, nor the inclusion of non-structural measures to ensure long-term sustainable flood risk management. In addition, there is no unified guidance on the design and construction of new flood defences and no requirement or methodology to include climate change considerations in the development of new structures.

257. There is currently no strategic integrated flood risk management approach in BiH that identifies the best combination of structural and non-structural measures to address climate induced flood risk. During the last decade the damages incurred from flood and flash-floods was USD 31 million in the VRB. During the last decade the cost of flood protection and rehabilitation works has doubled, including due to intensified processes as a result of climate change. The total planned and generated expenditures from the municipal budget allocated for flood protection in the VRB for the period 2004-2013 is presented in **Figure 7*:***

[23] Sub-strategy for the implementation of EU Directive on assessment and management of flood risks (2007/60/EC).

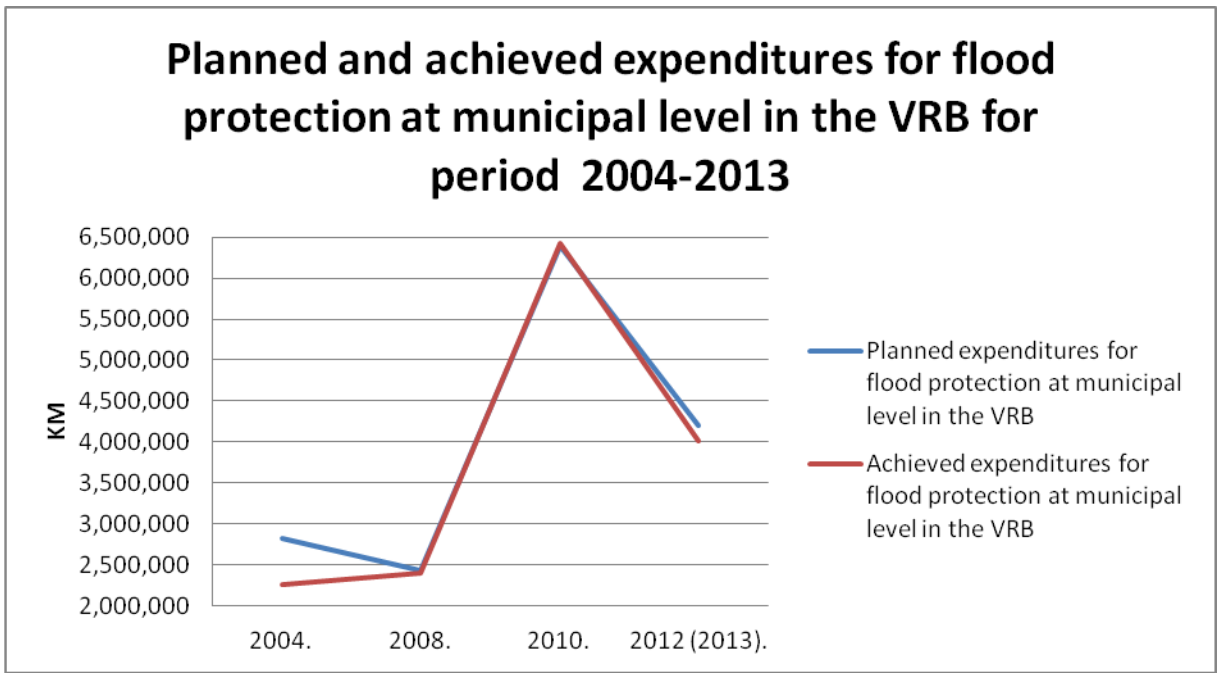


Figure 7: Planned and achieved expenditures for flood protection at municipal level in the VRB for the period 2004-2013 (Source: based in data from the entity institutes of statistics).

258. On average, 94% is the planned expenditure for flood defences is normally achieved over the period 2004-2013. In 2004, however, expenditure achieved was only 80% of planned. In 2010, 4.4% more was spent on flood defences than had been planned, due to the large sale floods that occurred in 2010. In 2010, the total expenditure across all municipalities was 6.5 million KM (USD 4.26 million). However this was far below the 2010 damages in VRB of 31 Million KM not including residential damages which were up to 52 Million KM.

259. In the previous period, certain municipalities disbursed the fees to citizens, agricultural producers and businesses as a compensation for the caused damages. Situation per municipalities is as follows:

260. Banja Luka city paid in 2009 105,000 KM (USD 75,000) to the citizens for purchase of household assets, minor reconstruction works on houses and similar. There were no fees for the damages in agriculture and business sectors.

261. G. Vakuf municipality paid in 2010 34,000 KM (USD 24,285) to the citizens for purchase of household assets, minor reconstruction works on houses and similar. There were no fees for the damages in agriculture and business sectors.

262. Čelinac municipality paid in 2010 1,700,000 KM (USD 1,214,285) as support funds of the RS government. That amount was spent for the needs of citizens, business and agriculture. Majority of the amount were the fees to citizens and businesses.

263. Jajce paid in 2010 36,000 KM (USD 25,714) to the citizens for purchase of household assets, minor reconstruction works on houses and similar. There were no fees for the damages in agriculture and business sectors.

264. Spatial planning does not take account of flood risk under climate change and this, in combination with the severe deficiencies outlined above will lead to poor landuse and water management practices that will put more lives and properties at risk of flooding in the future.

Agriculture

265. Entities agricultural policies only indicate the importance of the water – agriculture nexus through elaboration of issue related to melioration activities (irrigation and drainage) necessary for improvement of agricultural land and agriculture production. Climate Change is not even mentioned within the plans, and flood risks only generally as limited factors / risks due to occasional or frequent flooding of agricultural land.

266. Inter-sectoral cooperation has been mentioned, but not stressed as a prerequisite for reduction of flood risks to agricultural land. Plans of relevant entities supporting the agriculture sector do recognise the importance of very close cooperation and active participation of water sector and physical planning sector in policies elaboration. Only BiH Operational Program for agriculture, food and rural developments is setting, as one of the objectives, "gradual harmonization of sectoral policies and mechanisms at state, entity and cantonal levels in BiH". This requires improvement of adequate legislation as well as improvement of strategic plans which will take into account and elaborate the effects of climate change on agricultural productivity as well as define clear mechanisms which will ensure exchange of data and information between agricultural and water and physical planning policies, mechanisms for active cooperation of these sectors in strategic plans elaboration i.e. full harmonization of their objectives.

267. In addition to solving the issue of water management, agricultural master planning from the standpoint of flood protection and water supply, should have to consider the necessary basic and detailed systems of drainage and protection of agricultural land with regard to flood risk (to and from such systems). Consideration of flood risk (and opportunity) in the design of agricultural infrastructure, including climate change considerations, will ensure the resilience and sustainability of such systems. It is therefore necessary to embed flood risk under climate change considerations into the reconstruction and upgrading plans of existing hydro management systems.

Vulnerability of the Agricultural Sector

268. A particular cause of vulnerability in the VRB is the heavy reliance on agriculture for both commercial and subsistence revenue, and the disproportionately large impact that flooding has on this sector. Total income value from agricultural production within the VRB totalled 53.4 million KM (USD 38.1 million) in 2008., 60.1 million KM (USD 42.9 million) in 2011, and in 2013, 84.3 million KM (USD 60.2 million), which shows the trend of constant increase by an average rate of 26.4%. This is based on data for 8 municipalities and excluded the data for the city of Banja Luka, as well as the municipalities of Jezero, Laktaši, Srbac, Jajce and Mrkonjić Grad. Hence the actual figure, if these municipalities were included (they have well developed agricultural production), would be much higher. Hence, we can state that agriculture is one of the most significant economic sectors for VRB. Damages and losses to the agricultural sector in VRB can be high due to the location of agricultural lands (on flat, fertile land which is prone to flooding) and the impact on the food basket (for subsistence farming) and local economy (including production losses and whole season losses). A total of 4,373 agricultural households (or 25% of agricultural households) in the VRB (excludes data for the city of Banja Luka and the municipality of Mrkonjić Grad) have been affected by floods in the past. In 2012 flood damages to agricultural households totally approximately 21 million KM (USD 15 million).

269. There are about 8,875 registered agricultural farms in the VRB, and an estimated 12,265 unregistered agricultural producers (households) in the VRB (excludes data for the city of Banja Luka and the municipality of Mrkonjić Grad). This represents an annual increase of 5% between 2011 and 2012. Approximately 15% of total population within the VRB is engaged in agriculture and the number of citizens involved in agriculture (registered and estimated unregistered ones) is almost equal to the number of all registered employees in all other sectors within the entire VRB. Making agriculture the single most important sector for the VRB.

270. Within the VRB about 32% of total land is agricultural land which can be categorised as plough-fields and gardens, orchards, vineyards, meadows, pasture and ponds. Majority is plough land, meadows and pastures, while minor share are orchards, fish ponds and vineyards. In addition to agricultural land, there are forests, as well as arid land. Agricultural land is also very much affected by floods. In total, 20% of total agricultural land is affected by floods, where plough land and gardens are most affected (60%), while meadows and pastures account for 20% of land affected. In addition, in the municipalities Jezero,

Donji Vakuf and Kotor Varoš the floods jeopardised the fish ponds, so that in Donji Vakuf municipality 50% of all fish ponds are affected, in Kotor Varoš 17% , while in Jezero municipality all fish ponds are affected.

271. Information was not available on the size of land plots per ownership structure and percentage of land affected by floods, but the general review of size of agricultural households in BiH (taken from the Rural Household Survey (2012) developed by UNDP) suggest that the majority of agricultural households possesses small farms with 1-3 ha/cattle and generate rather low income from agriculture. Larger farms with significant income from agriculture are very rare. The following significant crops are grown within the VRB: wheat, rye, barley, oats, onion, maize – grain, soya, potato, carrot, garlic, bean, vetch, cucumber, maize, green pepper, mixture of leg. grass and cereal, clover, lucerne, pea, cabbage and kale, tomato, mixture of grasses and clovers, etc. The most important of which are: wheat, maize, barley and potato.

272. The average yield within the VRB for wheat totals 3.14 t/ha and it is 16% lower than the state average. Corn yield in this area is 2.87 t/ha and it is 3% higher than the state average. Barely yield totals 2.61 t/ha and it is 17% lower that the state average, while the potato yield totals 10.04 t/ha and it is 23% higher than the state average. Wheat production in the VRB makes 9% of total wheat production in BiH, while corn production in VRB is 15% and barley production is 16% respectively, of the total production in BiH. However, potato is the most significant percentage with 24% of total BiH potato production coming from the VRB.

273. It is evident that there has been a continuous trend in decrease of production scope of the mentioned crops in the past 5 years, except for production of wheat, whose scope of production increased again in 2012. Decrease in production quantities within the VRB was particularly significant in 2010, and the floods were surely one of the reasons to that, which strongly affected the VRB area. For the purpose of illustration, the production of potato in D.Vakuf municipality decrease from 5000 tons in 2008 to 80 tons in 2010, which is over 98% decrease in production. In all municipalities wheat production in 2010 within the VRB was lower by 20.91% while the yield per ha decreased by 5.65% in comparison with the annual average. Corn production decreased by 6.11%, barely production decreased by 14.34% with the decrease of yields of 8.38%, while potato production decreased by 6.28% with decrease of yields per ha for 5.59%. When these quantities of agricultural production was estimated to have sustained losses totalling approximately 13.000.000 KM (USD 9.300.000) due to floods.

274. The crops most affected by flooding are cabbage and broccoli (20% of produce), as well as clover (20% of produce is affected). 14% of rye and 11% of corn is directly affected by floods. Almost 10,000 tons of various crops in total was affected in 2012. Considering the prices of mentioned products from 2013, it may be concluded that the damage potential in crops totals 5 million KM (USD 3.57 million). Major damage was suffered by corn crops with 64% of all damages, wheat with 15%, cabbage with 11% and potato with 7% of total damage.

275. The VRB basin is characterised by production of large quantities of fruits, which is also of an outstanding quality. Important types of fruits within the VRB are: apple, pear, plum, peach, walnut, cherry, sour cherry, apricot, grapes, strawberries, raspberries and others. Apple, pear, plum are the most important fruits in terms of production quantity and quality of production. Apple production in the VRB makes 19.84% of total apple production in BiH. Pear production in the VRB makes 17.97% of total production in BiH. Percentage of plum production in the overall state production is the most significant, which in the VRB makes 21.33% of total production in BiH.

276. The municipalities of Banja Luka, Kotor Varoš, Srbac and Laktaši consistently realise the highest fruit yields. For example, within the municipality Kotor Varoš, outstanding results in plum yield are achieved with 70 kg/tree, while the average is about 10 kg per tree or in pear production with the yield of 120 kg/tree while the average is to 10 kg/tree.

277. Fruit production in 2012 varied significantly from the annual average except for production of plum, which is 27% lower than the average. The average yield within the VRB totals for apple 14.13 kg/tree and the yield is 62% higher than the state average of yield per apple tree. Plum yield in the VRB totals 1.96 kg/tree and is 54% higher than the state average. The plum yield is 13.32 kg/tree and is 54% higher that the state average of plum yield.

278. Data on orchards affected by floods are collected only from some municipalities. In Banja Luka city, cherry, apple, pear, plum and peach orchards are affected. Potential damage that might be caused by floods is estimated to 750,000-1,000,000 KM (USD 535,714-714,285). In Jezero municipality apple, pear, plum and walnut orchards are affected. Potential damage that might be caused by floods is estimated to 35,000-50,000 KM (USD 25,000-35,714). In Kotor Varoš municipality, the apple, pear and plum orchards are affected. Damage potential is not big and it may amount maximum to 50.000 KM (USD35.714). Other municipalities do not have these types of data available in fact the data on damage potential in fruits growing sector.

279. Livestock breeding within the VRB includes bulls, cows and pregnant heifers, sheep, swine, goats, horses, and mares. Poultry and egg laying hens, as well as bees are also kept. Each type of livestock is affected by floods, but the total damage potential is estimated to 7.81 million KM (USD 5.6 million), with cattle being the worst affected with 55% of the total damage potential, followed by cows and pregnant heifers with 18%, swine with 14% and sheep with 7% of total estimated possible damage.

Agricultural Infrastructure

280. Most of the irrigation infrastructure which was part of the former agro-kombinats (the state-owned enterprises), have suffered from significant dilapidation. Although some of the drainage/irrigation canal systems are over 100 years old and need rebuilding, they nevertheless play the dual role or providing excess water drainage in fall/winter, and water supply for irrigation in the dry summer months. Other systems, especially on former kombinats, are fairly modern, pressurized underground pipe systems with hydrants to which farmers connect irrigation equipment. The more modern systems have mainly been deteriorating since the war and since their privatisation over the past 20 years. In addition, their layout often makes them ineffective in delivering water to the numerous small parcels of land held by private farmers. Finally, the operational responsibility of existing irrigation schemes remains unclear and closer user participation in their management as well as discussions about their expansion is needed.

281. The World Bank projects 'Agriculture and Rural Development Project (ARDP) and the 'Irrigation Development Project (IDP), are supporting the rehabilitation and development of the agricultural infrastructure in BiH. The ARDP is part of a series of projects developed in the region to support the countries in their question for EU accession. ARDP supports the institutions and systems necessary for developing the traceability of food and foodstuffs and for establishing transparent EU-aligned agricultural payment systems, including all the registers, databases, legislation and regulations that are needed. The IDP project is financing the rehabilitation of irrigation infrastructure in both BiH entities in some of the most productive agricultural areas of the country. The project primarily finances works but also provides support to the formation of water users associations where appropriate and developed the institutional set-up to ensure adequate operations and maintenance and funding of the systems in a sustainable manner.

Energy

282. There is a gap in the policies, strategies and plans relating to dams and reservoir safety which will exacerbate flood risk in the VRB under climate change. Dams, by their very nature, create risks, which increase substantially without proper maintenance under climate change. According to the classification of the International Commission on Large Dams (ICOLD), dams of 15 metres and higher, as well as dams of 5 to 15 metres with water storage of no less than 3 million m3, are defined as large dams. The large dams on the VRB basin and their reservoirs are of great importance to the economy of BiH. They contribute to hydropower generation and water supply. They also contribute to seasonal and long-term regulation of river flow and therefore impact on river flooding. There is a risk that reservoir sedimentation could reduce flood storage and change channel morphology in the upstream reaches, thus exacerbating flooding, as well as the downstream reaches, affecting channel erosion. Importantly, if properly maintained, reservoirs could provide flood storage and alleviation functions, while at the same time, increasing the efficiency of hydropower generation and water supply. The establishment of effective legislation and specialized organizational structures in the area of dam safety are, therefore of great

importance for BiH especially with the view of anticipated climate change impacts on hydrological regimes.

283. The operation of the present and planed HPP reservoirs is mostly limited to the benefit of one function (hydropower production). That is the consequence of non-implementation of recommendations of water and urban planning sectors, but also all other sectors involved and of inadequate harmonization of different sectors plans within a country.

284. From a flood risk perspective, one of the dangers posed by HPP dams with power generation as the sole purpose or the overriding priority, is that power generation could conflict with flood alleviation which requires that storage is made available in reservoirs for flood flows, whereas power generation requires that water levels are kept high (and hence storage low) to maximise power generation. This dichotomy can be managed by careful management of the HPP for both functions, for example using operating rules that take multiple functions into account. Other risks associated with HPP dams have already been discussed earlier, related to dam safety and the likely increased risks under climate change. BiH is a member of International Commission on large dams and there are some dam safety practices in place, for example, dam owners are obliged to inspect their dam on an annual basis. It would be important to ensure that BiH dam safety is in line with international best practice and that climate change is taken into account in dam safety regulations.

285. The Water Strategy of RS stipulates that it is very important to introduce some basic principles in the small HPP planning process, and particularly in the process of their construction approval. Some of the most important principles are: small HPP are to be constructed only at the locations where they do not endanger the construction of some bigger water management structures and hydro-power structures which have better performances. Small HPP cannot be constructed in the area of national parks (according to Law on national parks in RS) as well as at locations which are proclaimed as locations of spatial protection. This requires adoption of adequate legislation, including licensing of new small as well as large HPPs, and adequate design documents according to the international standards.

Forestry

286. The RS Forest management Strategy 2011-2021 (Draft) lists the protective functions of forests in terms of Republic Srpska are as follows: erosion protection, and improvement of water regime, protection from adverse effects of wind, extreme temperature and solar radiation, rainfall regulation, protection from unwanted and harmful effects and other protective functions (protection of agricultural production, roads, noise, views and avalanches, etc.).

287. Due to degraded forest land, the hydrological function of forests has been reduced, resulting in destruction of humus-accumulation horizon; significant reduction in infiltration-retention capacity; intensification of the surface (flood) runoff and frequent occurrence of torrents. In forests with a priority function to protect streams and water sources specific measures must be applied in the management, and control of erosion processes. Conservation of land and water, in this sense, is significant to the extent that limits the development of forestry and should be a part of their general development.

288. The strategic objections and guidelines provided in the draft strategy states that:

289. Management planning should be directed toward maintaining and increasing the protective functions of forests to society (infrastructure protection, protection against soil erosion, protect water resources, flood protection and flood control, etc.)

290. Breeding interventions in protected forests, especially in areas prone to erosion processes, and management of special purpose must be fit for purpose;

291. Special attention must be paid to the forests with a protective function of water and watercourses in order to avoid negative effects on the quality and quantity of water resources;

292. Construction of infrastructure must be such as to minimize the destruction of land, bringing the land into waterways and to preserve the natural level and function of waterways and riverbeds;

293. The FBiH Forest Management Strategy has not yet been adopted but the document "Strategy for the Development of the Federation of BiH 2010-2020 - Department of Forestry and Hunting," provides the following strategic objectives in forestry:

294. To initiate an integrated cross-sector action at the state, entity and local levels, including climate change, bio-energy, water, biodiversity, food security and poverty reduction, to minimize adverse impacts on the forest.

295. Immediately focus on the mechanisms related to climate change as a top priority with special emphasis on the reduction of deforestation and degradation

296. Increase efforts in the development of integrated policies and strategies for effective management of forests and water resources.

297. Investigate the potential to develop energy forests in the context of a sustainable framework to minimize the risk of adverse effects in the forest, agriculture and energy sectors.

298. Strategic plans of forestry do take into account adverse effects of degraded forests which cause reduced positive hydrological role of forests (reduction of erosion). However, in reality, water and physical planning sectors and forest sector are often in conflict due to lack of legislation / regulation enforcement as well as lack of efficient inspection. Therefore it is necessary to establish mechanisms for active cooperation of these sectors in legislation and inspection enforcement and in harmonization of their objectives.